# Growth Poles in Spain: Concepts and Reality.

by

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Abstract

Since 1945 there has been a growing awareness of the very wide disparity which exists between the rich and poor regions of many countries. In a large number of cases this gap is progressively widening. In the search for a solution several countries have adopted a growth-pole strategy, amongst them Spain.

In this thesis the main features of economic development and regional planning in Spain are outlined. An analysis is made of regional underdevelopment in Spain by use of factor and cluster analysis. This is followed by a survey of growth-pole theory, with particular emphasis being given to the French school of theorists. The characteristics and aims of the Spanish growth-pole scheme are discussed, and the choice of the seven original growth poles is analysed by the use of trend surface analysis. Detailed studies of each of the seven growth poles are included and an assessment made of their differing experiences. The results from an industrial questionnaire survey are used to investigate the conditions which led to the establishment and development of the growth-pole firms and the reasons for their location within the growth-pole towns. Finally the Spanish experience is used as the basis for discussing the relative merits of growth poles as a planning strategy.

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## Names, Spellings and Conventions used.

Throughout this thesis English words and spelling have been used where possible and appropriate. Thus Spanish words have been used only in those cases where no adequate translation exists, eg. *minifundio*, *latifundio*, etc.

The one exception is the use of the word *río*, which is well known in English, and which avoids terms such as the 'river Tinto', and permits use of the more widely known 'río Tinto'. Place names present particular difficulties and the convention adopted here is to use Spanish spellings except where an English translation is very well known, as in the case of Corunna, Navarre, Seville, and Saragossa.

Commonly accepted abbreviations such as G.N.P., I.M.F., O.E.C.D., E.E.C., etc. have been used as well as the normal metric abbreviations. In addition those abbreviations in current use in Spain have also been used. These include:-

| | |
|---|---|
| I.N.I. | Instituto Nacional de Industria |
| S.N.T. | Servicio Nacional de Trigo |
| S.N.C. | Servicio Nacional de Cereales |
| S.N.C.P. | Servicio Nacional de Concentración Parcelaria |
| O.R. | Ordenación Rural |

Finally the term 'Planning Commission', which is used in the text, is also used in the references.

# Chapter 1

## Introduction

In the period since 1945 there has been a growing awareness of the very wide disparity which exists between the rich and poor regions of many countries. This awareness is manifest in the growing number of books and studies which have appeared on the problems of regional imbalance. At first these studies were concerned mainly with the regional problems of the more advanced nations, probably because of the easier availability of information in these countries. Many of these early studies, such as those on the South of the U.S.A., the Mezzogiorno of Italy, or the depressed regions of the U.K. have since become classics in this field. More recently studies of the less developed countries of the world have revealed regional disparities at least as great, and often much greater than those which exist in the more advanced world. Indeed it has been argued that the main problem of the less developed countries is not the gap which exists between them and the rich nations, but the gap which exists between the rich and the poor regions within their own frontiers.[1]

Despite the heightened awareness of the problem and the large number of studies which have been made, the gap between the rich and poor regions is not narrowing; indeed, in a large number of cases it is progressively widening. Because of this lamentable state of affairs increased attention has been given to the search for solutions, for strategies which will help to narrow the gap. A wide variety of solutions has been proposed ranging from agricultural reform to industrialization and, in Hirschman's words, the provision of 'social overhead capital' for the construction of roads, railways, water supply, etc. The experience gained from these early schemes was disappointing. Most agricultural reform schemes have been expensive and very slow in coming to fruition, it has been notoriously difficult to tempt new industries away from the advanced regions to the uncertainties of the backward areas, and the construction of large-scale public works has rarely yielded any substantial return on the capital invested.

As a result of the relative failure of many of these early schemes, in the early 1960's a number of governments began to search for alternative solutions. Several countries, amongst them developed nations such as Italy, France and the U.K. as well as less developed countries such as Venezuela and Angola, chose to adopt a growth-pole strategy.[2] In essence this was a move away from the older policies which spread development projects throughout a backward region to a policy which concentrated efforts in a few of the more favourable locations, where there would be a greater liklihood of the various schemes being successful and where there existed a possibility of economic growth being transmitted from the growth pole to the surrounding area.

This new strategy was reinforced by the appearance of a series of writings, mainly by French economists, claiming to have established a complete theory of economic development based on the concept of polarized growth. Since the early 1960's the study of the theoretical aspects of growth poles has itself become a major growth point within the geographical and economic literature, but curiously the practical question of whether growth poles form a suitable strategy for the promotion of economic growth has been relatively neglected. It is the purpose of this thesis to examine the more practical aspects of the growth-pole concept, in particular through an examination of the Spanish growth-pole scheme.

In many respects Spain provides ideal conditions for the study of regional development strategies. During the 1960's the Spanish economy underwent a phase of very rapid expansion, the average annual rate of increase in G.N.P. being 7.4% - the highest in Western Europe. During this period Spain was transformed from a predominately agricultural and rural society into a modern industrial and urban society. At the same time the regions of Galicia, Extremadura and Andalusia still exhibit many of the classical features of underdevelopment including an excessive reliance on agriculture, large-scale out-migration, abandoned villages, etc. In consequence there is, within Spain, the whole range of regional problems from congested industrial, metropolitan areas to very poor and abandoned

rural areas. However, one major drawback facing any study of development in Spain is the lack of previous work into the contemporary conditions and problems of the country. Notable exceptions in geography are the works by Fisher and Bowen - Jones,[3] Houston[4] and Naylon,[5] but despite these exceptions Spain still lacks the range and number of background studies which can be found for example, in the cases of Italy and France.

As yet no adequate account has been written of the development of the Spanish economy in recent years. In Chapter 2 an outline is given of the main features of the Spanish economy leading up to the establishment of the system of national planning in 1964. The characteristics of the planning system are discussed together with an account of the relative success and failure of the first three plans. This chapter provides the background to the problems of regional development in Spain and places regional planning and the growth-pole scheme within the context of the national planning system. Chapter 3 consists of an outline of regional planning in Spain. In this chapter the growth-pole scheme is seen as a logical development from the experience gained with earlier regional planning projects. In Chapter 4 an analysis is made of regional backwardness in Spain. Surprisingly, although there have been many studies of individual regions, no previous analysis has been made of regional underdevelopment within the national context. The study contained in Chapter 4 incorporates the latest techniques of factor and cluster analysis.

In Chapter 5 a survey is made of growth-pole theory with particular emphasis being given to the French school of theorists, as these formed the main influence on the planners who formulated the Spanish growth-pole scheme. Chapter 6 contains an account of the characteristics and aims of the Spanish growth-pole scheme including details of how the growth poles were chosen, how they operate, which industries qualify for inclusion within the scheme and what benefits firms may gain from the scheme. In Chapter 7 trend surface analysis is used as an 'objective' method for establishing the spatial patterns of development in Spain, including the existence of any 'natural' growth poles within the country. The choice of the original

seven growth poles is discussed in the light of this analysis.

Chapters 8 - 14 contain detailed studies of each of the seven growth poles. These studies include an analysis of the economy of the growth-pole provinces, an account of the improvements to infrastructure undertaken as part of the growth-pole scheme, and a preliminary analysis of 210 firms within the scheme. This latter is based on information obtained from a questionnaire survey of these 210 firms, which formed 80% of the firms in operation within the scheme at the time of the survey. In Chapter 15 the experiences of the seven growth poles are compared and an assessment is made of the efficacy of the growth-pole scheme as a measure for promoting industrial development. In Chapter 16 the results from the questionnaire survey are used to investigate the conditions which led to the establishment and development of the growth-pole firms and the reasons for their location within the growth-pole towns. Finally, Chapter 17 contains the conclusions of the thesis and attempts to place the Spanish experience, first within the context of growth-pole theory, and secondly within the context of regional planning problems in Spain. This chapter concludes with a discussion of the possibilities for applying growth-pole strategies in other parts of the world.

References

1) Williamson, J.G., Regional inequality and the process of national development: a description of the patterns, Economic Development and Cultural Change, Vol. 13 (1965) pp. 3 - 45.

2) See below, Chapter 5.

3) Fisher, W.B. and H. Howen-Jones, Spain, London (1958).

4) Houston, J.M., The Western Mediterranean World, London (1964).

5) The various works by J. Naylon are referred to throughout this thesis.

## Chapter 2

## THE NATURE OF THE SPANISH ECONOMY AND ITS DEVELOPMENT IN RECENT YEARS

### Introduction

In Spain central government traditionally takes a very active role in economic affairs, therefore an account of regional development and regional planning requires a background survey of the economic and political circumstances of that country. The need to understand the framework within which economic decisions are taken has been noted by geographers studying other areas. For example in a study of decision making and industrial location in Eastern Europe Hamilton emphasized the importance of the underlying political structure, showing that location decisions made under a socialist system may be significantly different from those made under a capitalist system[1].

In this chapter it is intended to look at the political and economic developments in Spain which led to the establishment in 1964 of a system of national planning, and with it new forms of regional planning.

### Spanish Political Economy

Since 1700 Spanish economic policy has been guided largely by the principles of *etatism*[2]. During times of stability and prosperity more liberal policies were pursued, but this only occurred for brief periods during the nineteenth century[3], and even briefer periods during the twentieth. In Spain *etatism* has proved to be more enduring than liberalism.

The *etatist* concept was developed mainly in France, where it has long been the view that:

> "the effective conduct of a nation's economic life must depend on the concentration of power in the hands of a small number of exceptionally able people, exercising foresight and judgement of a kind not possessed by the average successful man of business"[4].

At the end of the seventeenth century when France wished to expand her economy, she did so by protecting the home market, and by the state intervening in various sectors of the economy, especially in the creation

of new investment and in the establishment of new workshops. This policy, associated with the finance minister Colbert, had a considerable success and was much admired in Spain, which at the time faced a similar need to expand her economy. The replacement of the Habsburg by the Bourbon monarchy in 1700, and the accession of Philip V, who wished to establish French ideas in all aspects of Spanish life, led to 'Colbertism', becoming the established economic dogma in Madrid. 'Colbertism' complimented other Bourbon policies, especially the desire to achieve monarchic absolutism, and the attempt to break down regional differences and establish a more homogeneous state through centralism on Madrid.

After 1700, a high protective tariff was established, and the 'missing' imports were to be supplied from specially created Royal Factories. This was a direct copy of the French system, and the minister who conceived the whole scheme, Alberoni, considered himself a second Colbert[5]. Some of these factories produced luxury goods (tapestries at Madrid, glassware at La Granja), some were ordnance factories, and others were state monopolies such as the tobacco factory at Seville. The best known factory was at Guadalajara, which was founded in 1718 in an attempt to introduce new techniques and to make Spain self-sufficient in various types of cloth.

The disadvantages of these Royal Factories have been listed by the nineteenth century liberal economist Manuel Colmeiro[6], who pointed out that many private establishments were undercut and ruined by these state subsidised factories. Thus a state subsidy often caused a state monopoly. With a lack of competition there was little pressure on the state factories to keep down costs, to use their materials economically, or to relate wages to factory earnings. Managers were often selected for their political rather than their technical abilities. Most harmful of all, goods were produced on orders from management or the government, and not as result of market demand. All these factors led to high prices, poor quality, and large quantities of unsold goods.

The advantages of hindsight make it easy to criticise these early attempts at self-sufficiency. Nevertheless governments at this time had

little choice of policy, there was an urgent need to expand the economy, and liberal policies were thought to lead inevitably to discord and rivalry amongst producers and consumers. It was the execution of the strategy rather than the strategy itself which was at fault. What is less creditable is that in modern times the National Industrial Institute (I.N.I) should repeat many of the faults of Alberoni's factories (below).

Etatist policies were pursued throughout the eighteenth century, and the destruction caused by the Napoleonic Wars and the first Carlist War ensured that protection of the domestic economy continued well into the nineteenth century. It was not until 1841, and again in 1849, that there was a reduction in tariff levels and a reduction in the number of items which carried duty. The fall of the Bourbon monarchy in 1868 made possible the Arancel Figuerola, the free trade budget of 1869. Tariffs were again simplified and reduced in level, and provision was made to convert Spain into a completely free trade economy. However liberalism proved to be a brief interlude, and by 1891 there was a return to protectionism[7]. Amongst those opposed to free-trade were the producers of Catalan textiles, Asturian coal, Basque iron and steel, and Castilian wheat[8]. The loss of the remaining American colonies in 1898, and with them the loss of captive markets for Spanish goods, for many Spaniards confirmed the need to become self-sufficient and not to rely on trade for prosperity. From 1891 to the present day Spain has remained one of the most protected economies of Europe. However, even the high tariffs of 1906 and 1920 were not enough to protect Spain from external competition, and after 1929 much trade was carried out under restrictive bilateral agreements[9].

During the nineteenth century, protection was less a dogma than a series of concessions to various interest groups. In particular it was a concession to the growing force of regionalism. For example, the growth of Catalan regionalism depended on the growth of the Catalan economy, which in turn required a protected home market.

State intervention was never important during the nineteenth century,

mainly because of the opposition of the liberals. However the triumph of protection and traditionalism in the 1890's heralded a return to intervention policies, and the first interventionist law was passed in 1907. This law, introduced by the conservative minister Antonio Maura, forced the state to buy from national companies wherever possible, and only in exceptional circumstances to buy from outside Spain. The industrial law of 2nd March, 1917, made provision for direct dealings between private companies and the state, it allowed exemptions to be made from a wide variety of taxes and duties, and allowed preferential treatment to be given in dealings with the official banks and in obtaining government contracts. Although the 1917 law made little impact at the time, it was the first law to grant direct aid to industry; but more important, it laid the basis for the state interventionism which is in existence today[10].

Economic Policy and the Dictatorship of Primo de Rivera

During the dictatorship of Primo de Rivera 1923-1930 new policies were introduced, in part based on Fascist economic policies. In Spain some interest had been taken in Mussolini and Italian economic policies, but the most important influence came from French writers[11], especially Georges Sorel[12] with his ideas on 'syndicalism' (workers trade unions), and Léon Duguit[13], who gave emphasis to social inter-dependance and the concept of the 'organic state'. Fascism never developed a very strong or coherent economic strategy, but insofar as it had a fundamental economic principle this was "to maintain private property and individual initiative, but to limit their function in accordance with public interest"[14]. Economic policy was seen as a tool for furthering state ends, which are predominately social ends.

Economic policy during Primo de Rivera's dictatorship aimed to increase Spanish national income by: i) developing industry, ii) improving agriculture, iii) increasing exterior commerce, iv) developing public works and services to create an adequate base for the three previous policies[15]. However, the finance minister, Calvo Sotelo, who was mainly

responsible for economic policy during this period, concentrated attention on industrial expansion. A large number of committees were created to establish close co-operation between the government and various industries[16]. Each committee included all the major firms of an industry, thereby creating a monopoly situation and weakening the free market system within Spain. In fact the triumph of interventionism and the final death of nineteenth-century liberalism came in 1926, with the setting up of the Comité Regulador de la Producción Industrial. From that date it was impossible to create a new firm, amplify an existing firm, or change the location of a firm without the authority of the Comité[17]. Although the Italian corporativist programme may have been an influence, Spanish industrial policy largely sprang from domestic sources, from the old etatist tradition, and from the desire for industrial expansion. Indeed corporativism, the attempt to reconcile the conflict between capital and labour by including representatives of both within the same corporation, was not popular with the workers, and achieved little more than a minor development in wages policy[18].

In agriculture the main achievement was the stabilization of prices and the guarantee of minimum prices by the Comité Regulador de la Producción Nacional. Other policies included a re-afforestation scheme and a national service for agricultural credit, both of which were severely limited by lack of finance.

The most spectacular policy during this period was the public works programme. This included prestige projects such as the Seville and Barcelona exhibitions, as well as more basic schemes for road and railway improvements, and comprehensive plans for the development of river basins through the Confederaciones Sindicales Hidrográficas, although this latter policy was effective only in the Ebro basin.

Although the policies of the dictatorship were dressed up in the language of Fascism, in essence they were a continuance of traditional etatist solutions such as protection and intervention in industry, self-sufficiency in agriculture, and public works schemes. The purely Fascist

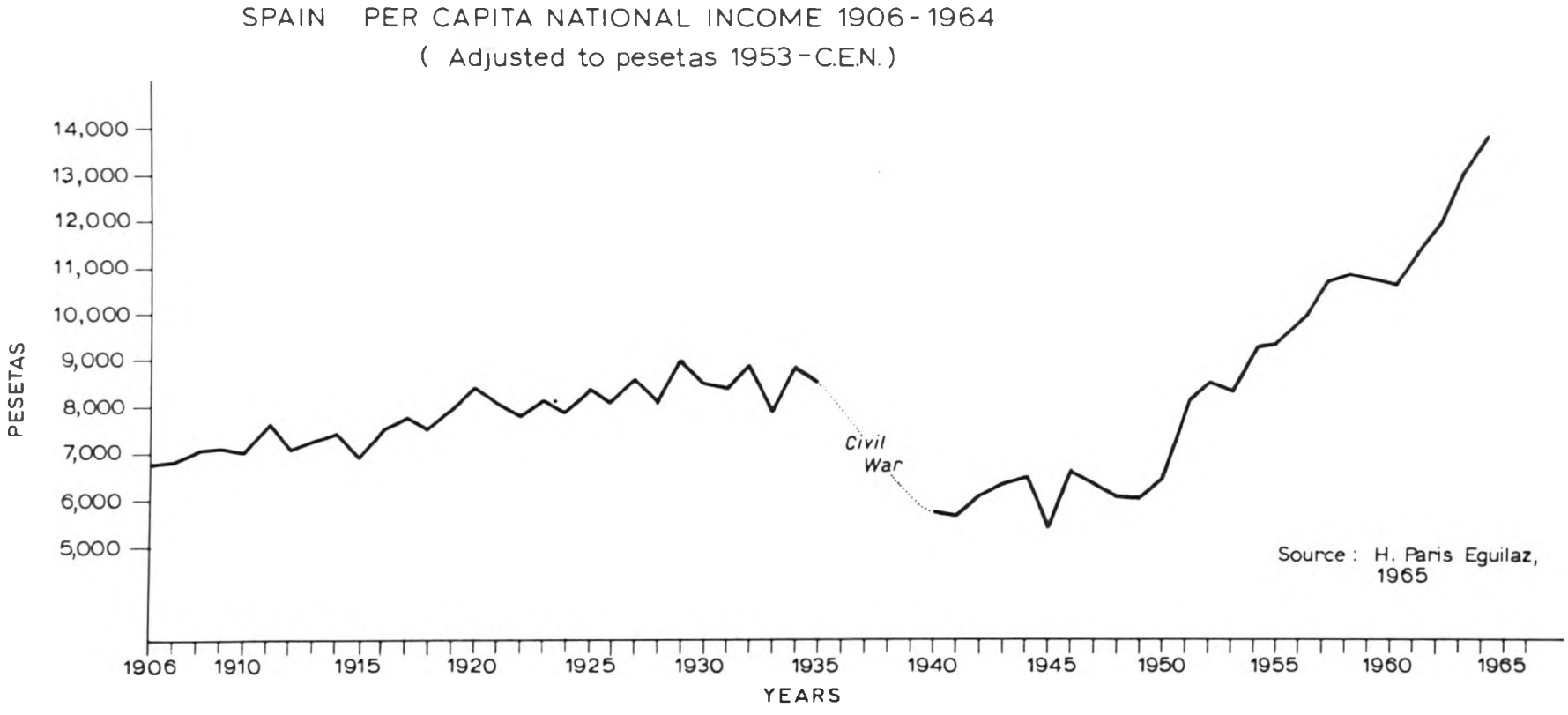
SPAIN PER CAPITA NATIONAL INCOME 1906 - 1964
( Adjusted to pesetas 1953 - C.E.N. )
PESETAS
14,000
13,000
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
Civil War
Source : H. Paris Eguilaz, 1965
1906
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
YEARS

FIGURE 2:1

elements, - vertical syndicates, corporations, confederations, - made little impact on the economy of pre-Civil War Spain.

The Spanish Economy from 1939 to 1959: Reconstruction and Economic Recovery

The instability of the Second Republic and the military operations of the Civil War precluded consistent economic policies until 1939. The policies of the new Franco government were, for the most part, dominated by the idea of restoring the situation which existed in Spain prior to 1931[19]. There was little in Franco's policies that was not foreshadowed by ideas and legislation in the First Dictatorship, indeed many of Franco's first ministers and collaboraters had held office in Primo de Rivera's government[20].

The period from 1939 to 1959 was dominated by the task of reconstruction and economic recovery following the Spanish Civil War. The Civil War had caused the destruction of a vast amount of material and infrastructure, roads, bridges, rolling stock, etc., as well as the deaths of half a million of the youngest and most able of the Spanish population and the further loss of political emigres. Reconstruction was delayed by Spain's virtual isolation during and after the Second World War. The Allies blockaded Spain and only let through sufficient supplies (e.g. oil) to ensure survival but not reconstruction. Spain's reconstruction was further delayed by a series of very bad harvests during the 1940's. It was not until 1952-1953 that production and income reached pre-Civil War (1935) levels (Figure 2:1).

Isolation came to an end in the early 1950's although it was not until 1959 that Spain finally gained admittance to major international bodies such as the World Bank, I.M.F. and O.E.C.D. During the period 1939 to 1959 Spain pursued a policy of economic self-sufficiency[21]. In agriculture self-sufficiency was frustrated by a series of bad harvests and droughts in the 1940's. To overcome the reliance on climate large irrigation schemes were begun, particularly in Badajoz (1952) and Jaén (1953) provinces, but their completion did not occur until the late 1960's. Industry was protected through the use of import licences and exchange controls, and foreign trade

was restricted entirely to essential goods. To promote self-sufficiency production controls were introduced, with the twin aims of concentrating resources on important projects and assisting those industries faced with a shortage of raw materials. In the industrial law of 24th October 1939, firms could be declared to be of 'national interest' and could qualify for tax reductions and guaranteed prices and profits[22].

The major innovation in industrial policy was the creation of the National Industrial Institute (I.N.I.) in 1941. I.N.I. is a large state owned industrial holding company. It was created partly in the style of the Italian Istituto per la Ricostruzione Industriale although it was also foreshadowed by the creation of the state petroleum monopoly C.A.M.P.S.A. in 1927[23]. The early aims of I.N.I. were to establish industries vital to the nation's defence, and to widen the country's industrial base. By 1957 these original aims were considered to be achieved and I.N.I. took on new aims and responsibilities: to be active in those sectors where returns were too low to attract the private investor but which were vital to the national economy; and to be active in those sectors which would stimulate or complement other sectors of the economy[24]. During this later stage I.N.I. has seen its role as a supplement rather than as a substitute for private investment. Indeed by 1965 out of a total of 66 I.N.I. enterprises, 48 were being pursued as joint projects with the private sector, the most noticeable example being I.N.I's 51% participation in the car firm S.E.A.T.[25].

There is no doubt that in its early days I.N.I. played an important role in the industrial reconstruction of the economy, especially in the basic sectors: electric power, iron and steel, chemicals, etc. In recent years many criticisms have been levelled at I.N.I.[26], that it still has many privileges and monopoly powers, that it has not always appointed top quality managers, and that too many unprofitable enterprises have survived for too long.

Economic Difficulties, Reform and the Stabilization Plan of 1959

In general economic recovery was very slow. There were delays caused

by a ponderous bureaucracy. The lack of foreign competition within Spain allowed many firms to continue using archaic methods. The exclusion of foreign capital meant the exclusion of foreign techniques, machinery and skills. There was a lack of any effective fiscal or budgetary policy, and tax evasion was very high, probably as much as 50% of theoretical tax totals[27]. Budgetary procedures were archaic and there was a lack of any monetary policy. These weaknesses and the general mismanagement of the economy became very noticeable after 1955, when there was an increase in investment in government agencies such as I.N.I. and the large irrigation schemes. This investment was financed out of inflation. A contributory factor was the large salary increase given to government employees in 1956. There was a rise in prices, a fall in the external value of the peseta and a rapid deterioration in the balance of payments[28]. By 1959 it was discovered that the country was close to bankruptcy.

In order to secure international loans to help Spain out of her difficulties and to put her own house in order, a series of economic reforms were started in 1957, leading up to an economic stabilization plan introduced in July 1959. In essence the plan consisted of increased discipline for the public sector and more freedom for the private sector. Various public services which had been a drain on the treasury, such as the state railway company R.E.N.F.E., were asked to reduce their deficits. Interest rates were raised and many control committees which had regulated a large proportion of industrial activity were abolished[29]. In the external sector restrictions were removed on capital movements making foreign investment in Spain easier, and important reductions were made in the levels of trade protection. The stabilization plan and the associated reforms were a considerable success, much of which can be attributed to the expertise of the new Opus Dei ministers, Sr. Navarro Rubio (Minister of Finance) and Sr. Ullastres Calvo (Minister of Commerce), who promoted these changes.

The stabilization plan rapidly took effect. Prices remained level at home, and there was a steady improvement in the balance of payments. Part

of this was due to a rise in exports helped by good harvests at home and by a rise in general demand in Europe. In part it was due to the rapid growth in tourism, which has made such a large contribution to Spain's invisible account. However this success was not achieved without difficulties occurring in certain industries, notably coal mining, construction and textiles. There was also a rapid increase in unemployment.

The period of economic reforms continued until 1964. In industrial policy many of the restrictions on the location and expansion of factories were abolished on 26th January, 1963; and on 22nd February, 1963, minimum sizes were established for new factories. Both laws were a necessary precursor to the development plan. The taxation system was modernised by the law of 11th June 1964, by widening the tax base, introducing more progressiveness into the system, and increasing yields by cutting down evasion. In April 1962 a Bank Reform Bill was introduced, establishing the Banco de España as a fully fledged central bank, creating facilities for open market operations, and providing for a closer regulation of the private banks. This Bill marked the inception of modern monetary policies in Spain.

The success of the stabilization plan of 1959 fully vindicated the whole reform programme, whilst external approval for these policies was contained in the report of the World Bank mission published in 1963[30]. However, the move away from rigid autarchy was not achieved without opposition; from Falangists who saw it as a betrayal of the principles for which they had fought during the Civil War; from civil servants who saw it as a threat to their quiet existence; and from those businessmen who benefitted from a protected home market. In the event, surprisingly little protest was made. In 1959, a questionaire sent out to government ministries and important national bodies showed almost unanimous support for increased liberalism and integration with Europe, suggesting that these policies reflected the wishes of the majority of Spaniards[31].

It is often claimed that the reforms of the period 1957-1964, and especially the stabilization plan of 1959, achieved the liberalization of

the economy[32]. The remarkably outspoken speeches to the Cortes of the Ministers of Finance and Commerce when introducing the stabilization measures, certainly reflect this opinion[33]. Sr. Navarro Rubio said that 1959 "ended the period of reconstruction", and "liberalization can substitute with advantage authoritarian controls", and that "liberalization is the spirit of stabilization". Sr. Ullastres re-affirmed this policy "liberalization means competition..... means cheapest prices for the consumer" and stated that the old system of protection was archaic. However, despite these statements and despite the reforms of the period 1959-1964 and membership of G.A.T.T., Spain still has high protective tariffs, there are still many state monopolies, government intervention persists in various sectors, and there is still no free labour market. The reform programme of 1957-1964 gave emphasis to the improved management of the economy rather than its liberalization.

The Growth of the Spanish Economy

The development of the Spanish economy during the twentieth century is shown clearly in the figures for per capita national income (Figure 2:1). From the beginning of the century until 1935 there was a period of sustained but slow economic growth, followed by the Civil War and the period of low economic activity during the 1940's. The upturn in the economy began in 1950 and was to continue throughout the decade until interrupted by the deflationary effects of the stabilization plan 1959-1960 (Figure 2:1). During the 1960's economic growth was renewed (Appendix A) and Spain became one of the fastest growing economies in the world. It has been suggested that various factors have caused this growth, including foreign aid, foreign investment, worker's remittances and tourism[34].

The most important source of foreign aid has been the U.S. government, although Spain did not receive any assistance under the Marshall aid programme. American non-military aid began in 1951 although the aid agreement was not signed until 1953, and was largely ended by June 1962. The total non-military aid 1951-1966 was $ 1,324m., of which half has been

in the form of grants ($ 681 m.) and half loans ($ 643 m.)[35].

American Non-Military Aid 1951-1966

$ 654 m. - purchase of agricultural produce and food.

$ 146 m. - purchase of non-agricultural raw materials.

$ 516 m. - purchase of machinery and equipment.

$ 8 m. - technological assistance and co-operation.

In the early years this aid was concentrated on agricultural produce and industrial raw materials, and in later years on capital goods and infrastructure. Non-American aid has been quite small, and has often been tied to specific projects, e.g. German aid for agricultural reform programmes in south-west Andalusia. Because of the small amount of aid received, and because of the form in which it was given, it is generally accepted that foreign aid has had little influence on Spanish economic growth[36].

Foreign investment in Spain first became important in the period 1850-1880 with the expansion of the railways and the mining industry (e.g. The Ríotinto Mines Co. Ltd. was established in 1873). In the period 1880-1914 foreign investment was concentrated more in public utilities (e.g. Seville Water Works 1883 and Barcelona Traction 1911). After 1882 political uncertainties slowed down the rate of foreign investments, and they reached a nadir during the autarchic period 1936-1959. During this latter period dividends could not be repatriated, or only with extreme difficulty. Also foreign firms could only have a 25% (in some cases 45%) holding in Spanish firms. The new regulations of the stabilization plan allowed foreign investment up to 50% in all firms, and above 50% in those firms not involved in public service and national defence. In the case of above 50% investments authorization has to be gained from the Council of Ministers. Dividends could now be repatriated without limitations, and official credit could be obtained. In cases where foreign capital is less than 25% there are no credit limitations. If the foreign capital is greater than 25% the firm is permitted to obtain credits at medium and long term up to the equivalent of 50% of its capital. As a result of these measures

foreign investment has rapidly increased since 1959 (Figure 2:2).

Only one quarter to one third of total investment has been in the form of direct investment in firms; the rest has been in the form of portfolio investments, investments in real estate and loans and credits. Direct investment has brought in a great deal of technology and expertise which, in one famous Spanish economist's phrase "has undoubtedly contributed to the economic progress of recent years"[37]. However it is becoming clear that in certain sectors Spain is undergoing 'economic colonization'. This is particularly true in the chemical industry, mining, iron and steel, petrol refining, cars and vehicles, and the manufacture of consumer durables. At the present time foreign capital constitutes approximately 10% of gross capital formation in Spain, and most of this is placed in those sectors which have advanced technology and high net returns, that is to say those sectors which are likely to be of most importance in the medium-and long-term.

Equally important as a source of foreign revenue are the remittances sent home by migrant workers (Figure 2:2). In the early 1950's the official Spanish attitude was of complete disapproval, thereby restricting migration to Europe to a few clandestine movements. In 1956 the Instituto Español de Emigración was created and migration to Europe made legal. In 1960 the government embarked on a positive migration policy, adopting strict controls but also giving considerable help and guidance to the migrants. Since 1960 there has been a rapid increase in the number of Spanish workers in Europe, who now number approximately one million[38].

In addition to improving the balance of payments[39], migration has reduced unemployment at home and accelerated the move away from a labour-intensive economy. Migration has also reduced the total number of unproductive people in Spain, thereby reducing imports and freeing domestic resources for export. Another benefit is the training the migrant may receive abroad, learning to work at European standards of production. The main drawback to migration is that it has deprived Spain of many of her most resourceful citizens. However on balance, migration has made an


SPAIN : NET INCOME FROM TOURISM, WORKER'S REMITTANCES AND FOREIGN INVESTMENT
MILLIONS $
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
1956
1960
1965
1970
YEARS
Tourist Income
Worker's Remittances
Foreign Investment
Source : International Financial Statistics, Current Volumes

FIGURE 2:2

important contribution to Spain's economic development (Figure 2:2).

Since 1958 tourism has been the most important source of foreign exchange, indeed by 1966 it was earning as much as the total of all Spain's visible exports. Tourism has become the single most important factor in promoting the Spanish economy[40].

The growth of tourism has depended largely on external factors, in particular on the spread of wealth in Western Europe leading to a massive demand for holidays supplying 'sun, sand and sea' at cheap prices. At the same time the rise in prices in other traditional tourist countries such as France has given Spain a considerable cost advantage. The growth of tourism has been due, also, to the support given by the government to the tourist industry. The present active policy dates from 1962, when, on the recommendations of the World Bank report, the Ministry of Tourism and Information was established in its present form. The Ministry is responsible for four main activities: price regulation of accommodation, the supply of credit for hotel construction, publicity services, and planning tourist zones. More recently the Ministry has become interested in diversification, through the establishment of government subsidised hotels - paradores and albergues - in less popular areas, and by promoting out of season business through the construction of winter sports centres[41].

Tourism has been important also in stimulating domestic industries, especially construction, the service industries, transport, banking, and the consumer-goods industries.

The National Economic and Social Development Plans

The National Economic and Social Development Plan (henceforth the National Plan) of 1964 was the culmination of the new economic policies of the Opus Dei ministers. In 1963 the minister in charge of planning, Sr. López Rodó had stated that the techniques of indicative planning "are probably the best suited to achieve the economic and social aims of the next stage of our development....."[42]. Indeed many of the economic reforms since 1961 were designed to facilitate the introduction of such a plan.

Traditionally France has provided the inspiration for many Spanish institutions, such as the education system, the civil service and the administration of government. Similarly the Spanish National Plan has been based on French experience, and in particular on the French fourth Plan of 1962-1965. The World Bank Report of 1963 supported French-style 'indicative' planning, believing this to be the most suitable system to promote growth. Indeed because of this belief, the possibilities of planning medium-term growth were being studied in most European countries at this time[43]. Under the French system, the output target for each sector of the economy is 'indicated', and also the means by which these targets are to be achieved. For the private sector the Plan remains indicative, although incentives may be used to ensure that targets are reached; but for the public sector the National Plan is obligatory, government ministries and agencies are expected to comply with the policies advocated[44].

The National Plan has been integrated into the established structure of government. The highest decision-making body in the government is the Council of Ministers (Consejo de Ministros) under the chairmanship of the Prime Minister (Presidente del Gobierno). In the 1957 re-organisation of the central administration, much of the Council's work was taken over by five Delegated Committees (Comisiones Delegadas) each with the Prime Minister as chairman, and each responsible for a certain range of government activities. It is the Delegated Committee for Economic Affairs which has ultimate responsibility for the National Plan[45].

The main task of elaborating and supervising the economic development programme is achieved by the Commissariat of the Development Plan (Comisaría del Plan de Desarrollo Económico y Social) which is attached to the Prime Minister's office. The head of the Commissariat, señor López Rodó, is accountable to the Delegate Committee, and although he does not hold cabinet rank he attends all its meetings.

The Commissariat organisation is purposely kept both small and simple. There is a permanent staff of approximately 50 people, the so called

"technocrats", composed of economists, engineers, statisticians, lawyers, agronomists, etc. These technocrats undertake all the 'staff-work' for the National Plan, although for detailed studies help is enlisted from government ministries and independent research firms. The permanent staff also contains a number of specialist groups, consisting of a Studies Group (Gabinete de Estudios) which is principally concerned with macro-economic studies; a Regional Action and General Affairs Group (Servicio de Acción Regional y Asuntos Generales) which has charge of regional development and of more general duties such as public relations; and an Office for the Surveillance of the Plan (Oficina de Vigilancia del Plan) which controls the Public Investment Programme and keeps a general watch on the execution and achievements of the Plan. The permanent staff have also established joint committees with two outside bodies, the Office for Foreign Capital Investment (Oficina de Inversiones de Capital Extranjera) and the National Statistics Institute (Instituto Nacional de Estadística). Both bodies are important for the Plan, the former because of the vital role foreign investment has played in stimulating the economy, and the latter because of the planners need for clear, unequivocable information. The permanent staff may also consult a Juridical Assessor (Asesoria Jurídica) for information on legal matters; and the Office for Co-ordination and Economic Planning (Oficina de Co-ordinación y Programmación Económica) which was created in 1957 to ensure co-ordination between ministries on economic affairs, but which itself has been largely superseded by the National Plan.

Apart from these groups there are the various Planning Commissions, whose members compose the non-permanent staff. The commissions are of two types : 23 comisiones, that are responsible for the major sectors of the economy such as agriculture, housing and tourism, and 6 ponencias, that are responsible for those elements common to all sectors of the economy such as labour, finance, and regional development. The function of these commissions include making general studies of the economy, suggesting policies and reforms for each sector, and informing the permanent staff of the progress of the Plan. The total membership of the Spanish commissions

is approximately 2,500, compromising a wide range of people from industry, government, the labour syndicates, the universities and professional bodies. Because of this breadth of membership, it is hoped that the views expressed by the commissions will reflect a wide range of opinion, and that the involvement of a large section of society in the process of planning will in itself further promote development. However, although the commissions perform a useful role as an independent forum for debate, in general they work in close co-operation with the permanent staff, and it is the latter who are responsible for the research studies and who effectively take most of the important decisions.

The Implementation of the Plan

The purpose of indicative planning in Spain is to co-ordinate existing economic agencies, rather than to create a new organisation. For this reason the implementation of the Plan is the responsibility of the appropriate government ministries and agencies, whilst the Commissariat has no executive powers at all[46]. Thus a separation of functions exists between the ministries which implement the National Plan, and the planners who prepare it, although in practise the planners can influence results through their powers of persuasion and co-ordination. The implementation of the National Plan occurs in the following three ways: through the co-ordinating activities of the planners, by government action on the private sector of the economy, and through government action on the public sector.

For the public sector the National Plan is obligatory, and the whole range of government activities may be used to further its aims. This includes all the normal economic functions of government: the budget, monetary and fiscal policy, prices and incomes policy, as well as the involvement of government agencies such as I.N.I. The stabilization plan had achieved a similar procedure for the year 1959-1960, but the innovation of 1964 was to extend this policy to a four-year period, and to increase the participation of the Public Investment Programmes.

This Programme (Programa de Inversiones Públicas or P.I.P.) affects all the investment plans of the government and the local authorities,

Macro-economic studies had established a top limit of 5% per annum for the growth of public authority investment, representing 334,997 million pesetas for the four years of the Plan, or 40.2% of all Spanish investment both public and private[47]. Part of the public funds were to come from an increase in tax receipts resulting from rising prosperity rather than from an increase in the tax base, and a projected short-fall of 12% of the required funds was to come from outside sources, the World Bank and various European governments. All projects under the control of the P.I.P. had to be assessed according to four basic criteria:- i) profitability, ii) creation of employment, iii) effect on the balance of payments, iv) effect on underdeveloped regions. Further consideration was given to (a) the completion of projects already begun (as recommended in the World Bank report), (b) the flexibility of the economy to meet changing conditions, and (c) the co-ordination of the overall investment programme. These principles established which investment projects were to be included within the National Plan[48].

For the private sector the National Plan is merely "indicative", although in practise the whole range of government activities can be used to encourage participation. In addition a new instrument was created for implementing policy, the Acción Concertada programme. This programme, one of the major innovations of the National Plan, was created with the objective of expanding and modernising the Spanish economy.

The principle of Acción Concertada is that the state and private industry should work together 'in concert' that there should be 'collaboration between the administration and private initiative' to pursue a common policy, to overcome specific problems, and to fulfill the Plan's targets[49]. Participation in the scheme is entirely voluntary; however, by agreeing to meet certain obligations private industry can gain financial, legal and technical benefits. The programme has been adapted from the ideas of Bloch-Lainé, and from French experience with the 'quasi-contracts' of the interim plan of 1960. This idea of 'concerted action' has proved highly compatible with the more traditional concept of corporativism and

the organic state.

The benefits obtainable under the programme can be large, and although there are variations between different sectors they include the following concessions:-[50]

Financial benefits

i) a 10% investment grant.

ii) official credit for up to 70% of all investments.

iii) credit for working capital.

Fiscal and legal benefits

i) Compulsory purchase of land.

ii) Reduction of up to 95% in various taxes, including local taxes.

iii) Freedom from amortization for the first five years.

Technical benefits

i) Preferential treatment in obtaining state technical advice and assistance.

The obligations of the firms vary but most include the following:-

i) Minimum size of output.

ii) The introduction of modern techniques and equipment.

iii) Improved working conditions for employees.

iv) The introduction of quality controls.

v) Raising productivity rates.

However, only in a few cases has the introduction of a target output for some future date been stipulated. This marks a clear change of emphasis away from the attainment of production targets, towards the re-organization of a whole sector. This is a welcome development in conformity with Spanish requirements, with the long-term interests of a sector being given priority over short-term gains.

The details of each Acción Concertada programme are worked out between the applicant firm and the appropriate ministry in conjunction with Ministry of Finance, the Syndical Organization, and the Planning Commissariat. The agreement is then subject to ratification by the Comisión Delegada de Asuntos Económicos, which each year also selects those industries which are

TABLE 2:1

Macro-Economic Forecasts of the First National Plan 1964-1967.

| | A<br>Plan Forecast 1967 | B<br>Actual Output 1967 | B/A% |
|---|---|---|---|
| Gross National Product | 1,045,800 | 1,616,000 | 155% |
| Private Consumption | 743,500 | 1,142,000 | 154% |
| Public Sector Spending | 86,600 | 160,000 | 185% |
| Gross Formation of Fixed Capital | 235,000 | 370,000 | 158% |

(in million pesetas)

Source: Planning Commission, Plan de Desarrollo Económico y Social 1964-1967, Madrid (1963). and
Memoria Sobre la Ejecución del Plan de Desarrollo Económico y Social - Año 1967, Madrid (1968).

eligible for assistance under the scheme[51].

The third means of implementing the National Plan is through the co-ordinating activities of the planners. In turn this depends on the planners receiving a flow of accurate and up-to-date information on the economy. To supply this information there is an Oficina de Vigilancia which watches over the public sector and every three months obtains from each ministry details of the P.I.P.'s progress. There is also a Comisión Permamente de Secretarios Generales Tecnicos de los Ministerios Económicos which has the private sector under surveillance and meets once a month to discuss the general economic situation[52]. With this information it is possible to make mid-term adjustments and avoid growing imbalances in the economy. In general it is hoped that this co-ordination will eliminate waste, avoid conflicting policies and give a natural cohesion to the National Plan.

The importance of co-ordinating economic activities had been recognised as early as 1946 with the creation of a Secretaría para la Ordenación Económica y Social although in practice this body was largely ineffective[53]. In 1957 the Oficina de Co-ordinación y Programación Económica did achieve some co-ordination of the government's economic activities, but was restricted to programmes already in existence, and no attempt was made to co-ordinate beyond the one-year budgetary period. However, co-ordination can be most effective in medium-term programmes, by predicting future conditions, foreseeing bottlenecks and other difficulties, and avoiding shortages[34]. This only became accepted practice with the introduction of the National Plan.

Results of the National Plans

As a guide to the economy the National Plans have not been very accurate. The most important single forecast is for the growth rate (G.N.P.). For the first National Plan a growth rate of 6% per annum was predicted, composed of 5% from increased productivity and 1% from an increase in active population. The achieved rates were:- 1964 - 6.9%, 1965 - 8.2%, 1966 - 7.8%, 1967 - 3.2% giving an overall growth of 27.7%

TABLE 2:2

Results of the First National Plan. 1964-1967.

| Product | Unit of Measure | A Plan Forecast 1967 | B Actual Output 1967 | B/A% |
|---|---|---|---|---|
| Agriculture | | | | |
| Wheat | ,000 TM | 3,996 | 5,598 | 140% |
| Potatoes | " | 5,151 | 4,197 | 81% |
| Citrus fruits | " | 2,042 | 2,269 | 111% |
| Rice | " | 481 | 367 | 76% |
| Wine | ,000 hecto-litres | 20,870 | 23,578 | 112% |
| Olive oil | ,000 TM | 499 | 272 | 55% |
| Fertilizers used in Agriculture | | | | |
| Nitrates | ,000 TM | 458 | 446 | 97% |
| Phosphates | " | 410 | 343 | 84% |
| Potash | " | 105 | 146 | 139% |
| Energy | | | | |
| Bituminous coal | ,000 TM | 51,900 | 39,613 | 76% |
| Anthroacite | " | 14,600 | 11,048 | 75% |
| Lignite | " | 14,750 | 10,681 | 72% |
| Crude oil* | " | 51,500 | 59,700 | 116% |
| Hydroelectric power | Million kwh. | 105,522 | 90,231 | 86% |
| Thermalelectric power | " | 30,039 | 49,318 | 164% |
| Metals | | | | |
| Steel | ,000 TM | 4,500 | 4,512 | 100% |
| Pyrites | " | 2,850 | 2,393 | 84% |
| Potash | " | 878 | 505 | 58% |
| Lead | " | 110 | 52 | 48% |
| Zinc | " | 82 | 70 | 86% |
| Aluminium | " | 70 | 78 | 112% |

TABLE 2:2 cont.

| Product | Unit of Measure | A Plan Forecast 1967 | B Actual Output 1967 | B/A% |
|---|---|---|---|---|
| Housing and Construction | | | | |
| Cement | ,000 TM | 13,275 | 13,099 | 99% |
| Bricks and Tiles | " | 10,030 | 14,358 | 143% |
| Dwellings* | units | 727,164 | 1,013,016 | 139% |
| Engineering | | | | |
| Cars | units | 200,000 | 274,000 | 137% |
| Industrial vehicles | " | 50,000 | 89,290 | 179% |
| Tractors | " | 28,000 | 19,026 | 68% |
| Shipbuilding* (Merchant ships and fishing vessels) | TM dead-weight | 1,112,400 | 1,245,000 | 112% |
| Food Industry | | | | |
| Vegetable conserves | TM | 502,000 | 577,000 | 115% |
| Pastas | " | 95,500 | 120,000 | 126% |
| Coffee | " | 57,000 | 54,000 | 95% |
| Beer | million litres | 700,000 | 941,000 | 134% |
| Non-alcoholic drinks | " | 240,000 | 130,000 | 54% |
| Textiles | | | | |
| Cotton yarn | ,000 TM | 145 | 129 | 89% |
| Cotton fabric | " | 115 | 126 | 110% |

* For all 4 years of the Plan 1964-1967 inclusive.

Source: Planning Commission, Plan de Desarrollo Económico y Social 1964-1967, Madrid, (1963) and
Memoria Sobre la Ejecución del Plan de Desarrollo Economico y Social - Año 1967, Madrid (1968).

for the four years, whereas the Plan predicted 26.2%. Thus in the 'normal' years of 1964, 1965 and 1966 the predicted growth rate was fairly inaccurate, and under the special conditions of 1967, strong deflation followed by devaluation, the forecast was completely inaccurate. The other macro-economic predictions were also in error, and by similar amounts. The figures in Table (2:1) show that the planners consistently underestimated the level of general economic activity within Spain. They also underestimated the levels of trade, for the growth of imports and exports over the four-year period was forecast at 41.9% and 45% respectively, whereas the achieved growth was 77.9% and 88.2%[35].

The sector results show similar variations from the forecasts, (see Table 2:2) with none of the six basic agricultural items having been predicted with any accuracy. The high wheat crop has been due to a series of good harvests, and to the price support system which has led to an overemphasis on cereals. At the other end of the scale olive production has been going through a crisis period, partly due to a shortage of rural labour. For much of agriculture the dependence on unknown factors such as climatic conditions and markets make accurate forecasting impossible.

The estimates for the energy market have also been inaccurate, but the discrepancies have tended to be self-cancelling. A short-fall in the output of coal was compensated by an increase in oil consumption, and the overall energy requirements remained close to the estimations. Similarly a shortfall in hydro-electric-power production, caused by low rainfall and the slowing down of the dam construction programme, was offset by an increase in thermal-electric-power production, and the total production of electricity remained close to the forecast (102.9%).

In general forecasting appears to be more accurate for those sectors which are not dependent on foreign markets. Thus for the metals industry, steel and aluminium were accurately assessed, whilst export items such as pyrites, potash and lead were grossly overestimated. Forecasting is also more accurate for the basic items, such as energy, steel and cement, where a shortfall in one market has been balanced by increased demand elsewhere.

TABLE 2:3

Results of the Public Investment Programme 1964-1967.

| Sectors | Investment Programmed | Investment Realised | Realisation |
|---|---|---|---|
| Social Investment | | | |
| Education | 22,154 | 19,309 | 87.2% |
| Housing | 67,749 | 70,810 | 104,5% |
| Health and Social Assistance | 3,623 | 4,049 | 111.8% |
| Information Services | 945 | 1,056 | 111.8% |
| Investment in works etc. for military establishments | 6,215 | 6,215 | 100.0% |
| Investment in Productive Sectors | | | |
| Agriculture | 19,246 | 14,358 | 74.6% |
| Irrigation works | 43,360 | 39,380 | 90.8% |
| Transport | 92,680 | 90,414 | 97.6% |
| Telecommunications | 1,760 | 1,274 | 72.4% |
| Tourism | 1,522 | 1,590 | 104.4% |
| Scientific and Technological Research | 2,198 | 1,977 | 90.2% |
| Commerce | 1,031 | 737 | 71.6% |
| Other Sectors | 14,617 | 11,318 | 77.4% |
| Development areas (Growth Poles) | 1,871 | 935 | 50.0% |
| Government Finance (I.N.I. etc.) | 57,257 | 51,906 | 90.6% |
| Government Approved Investments | (Redistributed amongst other sectors) | | |
| Totals | 336,235 million pesetas | 315,337 million pesetas | 93.8% |

Note: the figures are given as in the Memoria. they do not add up correctly.

Source: Planning Commission, Memoria Sobre la Ejecución del Plan de Desarrollo Económico y Social - Año 1967. Madrid (1968) p.73.

Another important lesson reflected in these figures, is that short-term policy must follow the dictates of the Plan. The inflation and balance of payments crisis of 1966-1967 should have been checked earlier. It was the divergence from the main macro-economic targets, particularly the short-fall in exports and the rapid rise in imports, which acted as the biggest brake to development.

The results of the P.I.P. have been summarized in Table (2:3). During the operation of the first Plan, several adjustments were made in response to changing conditions. Success in the first two years led to an upward revision of the total investment from 334,997 million pesetas to 336,325 million pesetas, and the section marked 'Government Approved Investments' was re-distributed amongst the other parts of the P.I.P., a sign of the built-in flexibility of the programme. However, following the anti-inflationary measures of October 1966 restrictions were placed on all investments, especially the large irrigation works, and were carried through to the end of the Plan, with the result that the P.I.P. only achieved 93.8% of realization. (315,337 million pesetas achieved, against the projected 336,235 millions).

Criticisms can be levelled at the objectives of the P.I.P. In the original programme the four sectors Housing, Transport, Irrigation Works and Government Finance together accounted for 76% of investment (78% of achieved investment). The re-structuring of the economy is therefore concentrated into these four sectors, whilst education which is vital to the long-term development of the country received very little assistance at all. Similarly the Development Areas (Growth Poles)received only derisory aid in comparison with the Irrigation Works, and yet they are both charged with the same essential task of creating wealth and employment in backward and rural areas.

The results of the P.I.P. (Table 2:3) show low achievements in Education, Agriculture, Telecommunications, Commerce and Regional Development; whereas Housing, Health, Information Services and Tourism not only exceeded the general achievement level of 93.8%, but the original

target levels as well. Both in concept and in execution the P.I.P. has avoided investments in basic reform programmes. Professor Sampedro has suggested that this pattern of achievement is due to "resistance by the conservatives" who are using the Plan to preserve the status quo[56]. These conservatives include such groups as the Church, the latifundistas, and the industrial monopolists who resist any attempts to reduce their privileges.

The aim of the Acción Concertada programme is the long-term reform of Spanish industry, and so the results of the first Plan only represent an interim statement of progress. The first sector to qualify for aid under the scheme was the iron and steel industry. This took place on 22nd August 1964, but was rapidly expanded into a complete National Siderurgical Programme (Programa Siderúrgico Nacional) for the period 1964-1972. Under this programme the State is to make available 40,000 - 45,000 million pesetas to the industry until 1972, representing 70% of foreseen investment, and enabling steel production capacity to double to 8,553,600 TM by 1972. The programme makes provision for re-structuring the sector, for the merging of firms and the introduction of new techniques and new plant. All the major firms, including the state-owned Ensidesa, private firms such as Altos Hornos de Vizcaya, and Uninsa (Unión de Siderúrgicas Asturianas), itself the result of the amalgamation of three Asturian firms in 1961, are incorporated into the programme. Evidence suggests that at present there has been little investment, and therefore, that the programme is much behind schedule[57].

The second most important Acción Concertada agreement was for the coal-mining industry, which by 1964 was in great need of reform. Difficult geological conditions and lack of capital investment had led to low levels of productivity, low wages, poor working conditions, and inevitably the worst history of labour unrest in all Spain. In March 1965 a programme for the sector was agreed with the following objectives: the amalgamation of small firms, a minimum output of 1,100 kgs per man-shift, and an overall increase in production of 20%. By the end of 1967 this programme had given rise to two important developments, the closure of 48 unproductive

pits with more to follow, and the amalgamation of the important groups of collieries in the Mieres - Langreo - Aller district of Oviedo into a single firm, Hunosa (Empresa Nacional Hullera del Noroeste de España S.A.)[38]. Hunosa also has a State interest of 50% managed through I.N.I. The rationalization programme envisaged for Hunosa involves 3,600 million pesetas and includes the closing of many shafts (28 reduced to 5), concentration around one pit head in each valley, improved surface processing plant, and a social fund for the improvement of working conditions.

Despite these reforms the sector is still in a state of considerable difficulty. Many of the problems remain intractible, and in recent years there has been a fall in production. Between July 1968 - July 1969 there was a 11% drop in output[59].

A third Acción Concertada agreement was signed in July 1967 for the shipbuilding industry. The agreement facilitates capital investments in new machinery, and the promotion of mergers and mutual assistance programmes between yards. The programme has helped the recent revival in shipbuilding, which has grown from a minor industry in the 1950's to the fourth largest in the world at the present time.

Other sectors with Acción Concertada agreements include: cattle breeding (signed November 1964), vegetable preserves (October 1964), leather (August 1964), paper (September 1965), and iron ore mining (September 1967), none of which so far have had any real success.

A number of serious criticisms have been levelled at the various agreements, particularly by the planners themselves. In the 1965 report on the Plan[60], three main limitations were listed: a) the lack of an overall plan for each Acción Concertada sector except in the case of iron and steel, b) the agreements were found to be difficult to implement in an industry composed of many small firms, c) the administrative processes at both a local and a national level had been far too slow. In the 1967 report[61] these three limitations were found to be still in existence. A further inadequacy is the limited regional impact of the schemes, with the

majority of the investments concentrated in the one province of Oviedo which has both coal and siderurgical works. However, despite this heavy concentration of investment, the province lacks an overall plan to co-ordinate the various agreements and to cope with such broader issues as finding alternative employment for displaced miners and steel workers.

The restricted scope of the programme is its biggest limitation. Acción Concertada is the main instrument for the modernisation of Spanish industry, and yet it applies to a very limited number of sectors, and has only had a significant impact on the siderurgical, coal and shipbuilding industries. However, almost all Spanish industry requires heavy capital investment and basic structural reforms.

In general the results of the first National Plan suggest that much of the economy is still not in the hands of the planners, they were clearly unable to achieve the Plan's objectives for many sectors of the economy, they were unable to overcome resistance to change and reform, and they also appear to have had little control over the basic forces in the economy. Perhaps all this was due to a fundamental lack of political reality.

> "Perhaps, and this is one opinion, they (the planners) committed the error of believing that economic development is primarily an economic matter. They scarcely took into account the political priorities of a true plan of economic and social development"[62].

The Second and Third National Plans

The devaluation of the peseta in November, 1967 caused modifications to be made to all the main projections of the second National Plan, thereby delaying its inception until 11th February, 1969.

The experiences of the first National Plan led to changes and innovations in the second, the most important being the increased emphasis given to human and social factors. "All that is contained within the second Plan is imbued with the same idea: that man, the individual, is the destination for the benefits of the development"[63]. This principle forms the basis for action not only to alleviate social problems, but for the whole range of the National Plan's activities. For example, in agricultural policy more emphasis is to be placed on the education and welfare of the

farmers and farm-workers, and less on the farm itself.

A second important change has been the attempt to improve the efficiency of planning, through better co-ordination within the economy. This, it is hoped, will be achieved through tighter financial controls, better supervision to avoid conflicting policies, and the amplification of the P.I.P. to include a wider range of state spending particularly in education and social affairs. Efficiency is also to be improved through the introduction of a system of warning signals - señales de alerta for six critical parts of the economy. These are:- i) the cost of living and the general price of land, ii) the external trade balance, iii) the gold and currency reserves, iv) the monetary supply, v) industrial production, and vi) unemployment. When any of these diverge beyond the 'limits of tolerance', the planners have to decide whether or not any counter-action should be taken, and if so the form it should take.

A third innovation is the adoption of a strategy of 'selectivity'. This will concentrate on the weaker sectors of the economy which either have a social importance, or are vital to the long-term development of the economy. The five sectors chosen for this purpose are: i) education, ii) agriculture, iii) transport and communications, iv) housing and urbanisation, v) basic industries; however of these the first two are to receive the greatest assistance. This should help focus attention on the two sectors that are most in need of help and reform.

The third National Plan, 1972 - 1975 has seen a general continuation of the policies of the second, with the important exception of regional policy (see Chapter 3 below).

Conclusions

The standard accounts of Spain since the Civil War usually state that at first there was a period of reconstruction and autarchy, and then in 1959 there was a sudden change in policies which has led to the present period of high economic growth. The year 1959 is seen as a turning point in Spanish history. For example Sr. L. López Rodó has stated that "life in Spain is undergoing a real transformation, especially since 1959. I

TABLE 2:4

Elements of Continuity in Spanish Economic Policy.

| | The Development Plan | Earlier Concepts and Policies |
|---|---|---|
| i) | The national plan | The organic state |
| ii) | A centralised plan | Centralism |
| iii) | The *ponencias* and *comisiones* | The control committees of 1926-1930 and 1939-1960. |
| iv) | Technocrats | Government bureaucrats |
| v) | Economic forecasts and projections | The foresight and judgements of the bureaucrats in an etatist state |
| vi) | Protection of the home economy | Strong protection of the home economy. |

believe that year will be a milestone in Spanish history"[64]. In one sense 1959 was decisive, in that it represented a victory for the 'new men', the Opus Dei technocrats, against more traditional forces within the government. In terms of economic policy, 1959 represents a point on a continuum rather than the moment of fundamental change. Spain is continuing within the etatist tradition of protection, of government participation in industry, of centralism, etc.

The structure of the development plan and the methods used for its' implementation show many important elements of continuity with earlier policies. Some of these elements are shown in Table 2:4. The main change brought about by the plan has been in the government's relationship with industry, which has changed from a policy of direction to one of consultation and coercion. In general the elements of continuity have proved strong, probably because of the unchanging nature of many of the economic problems.

The limited success of the first National Plan does raise the question whether or not indicative planning is the best economic strategy for Spain, but at the present time there would appear to be no feasible alternative. Market capitalism in the anglo-saxon style is not yet possible because of the lack of an adequate capital market and banking system, and the shortage of skilled managers and entreprenuers. At the other extreme, strong centralist planning would be highly inefficient given Spain's ponderous bureacracy.

Indicative planning does have a number of positive advantages which make it relevant to conditions in Spain. It provides a modus vivendi between the existing large public sector and the growing private industrial sector; it introduces into investment decisions wider issues such as the public interest and long-term considerations; it provides a platform for a continuous discussion of the state of the economy; and it often highlights economic problems although it is not always in a position to change them.

The poor quality of the forecasts has raised doubts about the

effectiveness of indicative planning. However the forecasts are only a part of planning, which essentially is concerned with establishing priorities, and agreeing on the disposition of resources to attain these priorities. The forecasts are an attempt to 'see into the future' and by themselves have little value; it is the resultant action, the implementation of the plan which is important[65]. For this reason the emphasis throughout has been on maintaining momentum towards chosen goals, rather than precisely achieving the sector forecasts.

In recent years Spanish society has undergone a series of fundamental changes - the emergence of a mass-consumption society, the growth of cities through massive rural-urban migration, the desire for a 'European' standard of living, and the rise in the employment of women and the changes this has brought about in the traditional mores of society. In future all industrial activity and economic decisions will have to work within the framework of this new socio-economic structure. The National Plan represents the government's attempt to come to terms with this new situation.

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Chapter 3

# THE HISTORY OF REGIONAL PLANNING IN SPAIN

## Introduction

In Spain rural poverty and regional underdevelopment were first recognised as serious problems during the sixteenth century, whilst the search for remedies has been a major preoccupation of Spanish intellectuals and reformers from Feijoo and Jovellanos in the eighteenth century to contemporary writers such as the economist Ramón Tamames. The basic causes of rural poverty have been the excessive pressure of population on the land, an arid climate, poor soils, and the inequitable and inefficient distribution of the land that occurs with the large estates, latifundios, and the small fragmented farms, minifundios.

Until the late 1950's all attempts to change this situation were concentrated on land improvement schemes, especially irrigation and colonization projects and to a lesser extent on the redistribution of the land. In recent years the advent of industrialization has lifted Spain out of its general poverty, but at the same time it has accentuated the differences between the wealthy regions which have manufacturing centres and the poor regions which are still dependent on agriculture. The present situation is best summarised in the studies of the Banco de Bilbao which show that in 1971, the per capita net income in each of the five richest provinces was more than double that in each of the ten poorest[1]. A full analysis of the present situation is presented in chapter 4 below. In this most recent period new policies have been applied, the most important being the attempt since 1964 to industrialize the poorer regions through the growth-pole scheme.

## The early attempts to deal with the underdeveloped regions of Spain

The first evidence of official concern being taken in regional problems occurred in the sixteenth century, with the discovery that large areas of central Spain were becoming depopulated. The government ordered a series

of enquiries, the Relaciones Topográficos of 1575 and 1578 to investigate the social and economic causes of this depopulation. However, despite these enquiries no attempt was made at this time to improve the harsh social and economic conditions under which the rural peasantry was forced to exist, and which contributed so much to the strong movements of population to the richer coastal areas of Spain, to the new American colonies or to the Spanish empire in Europe[2]. It was not until the reign of Carlos III, 1759-1788, that any serious attempt was made to solve these problems. Carlos III's leading minister, the count of Campomanes, introduced the first scheme for promoting regional development in Spain which was based on the colonization of uncultivated land.

The colonization policy was an attempt to solve the rural problems of Andalusia. During the eighteenth century agriculture in southern Spain was dominated by three phenomena: large areas of uncultivated land, the baldíos; the predominance of large estates, the latifundios; and the desperate hunger for land by the vast mass of the rural peasantry. The new policy was to introduce new peoples to the region who would be alien to the bad practices and customs of the area, who could have their own rights and laws, and who would not fall under the influence of the latifundistas. The scheme was approved by Royal Charter in 1767, and catered for the installation of 6,000 Bavarians in a number of new settlements on uncultivated lands in the Sierra Morena (Figure 3:1). The new settlements were to populate the zones along the Madrid-Cádiz and Valencia-Andalusia highways, in order to combat the banditry rife in those areas and to create model settlements which, by their example, would lead to improvements throughout the rest of Andalusia.

In the event 7,764 colonists were accepted and included French, Italians, Swiss and Flemings as well as Bavarians[3]. Each colonist was given land, a house, livestock and agricultural implements in return for a rent paid to the crown. Special provision was made to stop the growth of large landholdings, the subdivision of land, subletting, etc., and except for the parish priest all religious orders, aristocrats and other non-productive classes were prohibited from entering the settlements. Eventually 44

villages and 11 towns were established over an area of 2,500 square kilometres[4]. The English writer Joseph Townsend, travelling through the area in 1786 and 1787 described the new settlements as appearing like oases in the Spanish countryside[5].

News of the scheme quickly spread and many Spaniards flocked to the area and installed themselves on the edge or within the new settlements. Soon the foreign-born colonists were in a minority. Despite the apparent success of the scheme the foreign colonists began to desert the settlements, especially after 1770. Many could not survive the difficult conditions of a harsh climate and very poor soils. Many succumbed to disease. After 1770 Madrid insisted that the settlements should show a bigger financial return. Pablo Olavide, one of the originators of the scheme and its first superintendant, was forced to raise the colonists' rents, at which point many colonists deserted to go and work in the mines in the area. Despite these difficulties the scheme continued to make some form of progress until 1776, when Olavide was arrested and condemned by the Inquisition, the last major figure in Spain to be so treated[6]. After the fall of Olavide the settlements went into a gradual decline until 1835, when they were absorbed into the rest of the administration. Although the practical experience gained in these early attempts at regional planning was soon lost in the political and military upheavals caused by the Napoleonic Wars, the ideas on which they were based were to have a lasting influence. For example López de Sebastián has shown that many features of the Sierra Morena scheme were reviewed in the Badajoz Plan of 1953[7].

During Carlos' III reign work was begun on two other rural improvement schemes, both based on the construction of large canals. In Aragón the contrast between the desert and semi-desert conditions of the dry farming areas and the rich huerta lands is very marked indeed, and the idea of using water from the Ebro and the other rivers of the region is thought to date back at least to Roman times. Throughout the medieval period small irrigation canals were constructed on various tributary rivers, but attempts

to use the waters of the Ebro river itself were frustrated, usually by floods carrying away the main dam[8].

The project for a major new canal on the Ebro was revived in 1768. This new project made little progress until 1772 when it was placed in the hands of Ramón de Pignatelli, canon of the La Seo cathedral in Saragossa. It was largely through the indefatigable energies of Pignatelli that the Imperial Canal of Aragón was completed (Figure 3:1). By 1780 the key to the project, a dam across the Ebro at Fontellas was constructed, and four years later, in 1784, the first canal water arrived at Saragossa[9]. After the completion of the canal there was considerable opposition to the surrounding land being used for irrigation. Most of this opposition came from the large landowners of the region, and between 1784 and 1806 Pignatelli became involved in a long campaign to overcome this opposition and to persuade various communities to undertake irrigation work. Despite these difficulties contemporary reports suggest that the Imperial Canal of Aragón did much to raise the standard of living within the newly formed irrigated areas[10].

The other major project, the Canal de Castilla, was originally designed as a transport canal to link the provinces of the northern Meseta with the sea at Santander (Figure 3:1). This project was first conceived during the sixteenth century and some minor works started[11]. Work on the project was resumed in 1753 but had to be suspended in 1779 and it was not until 1840 that the canal reached Alar del Rey at the foot of the Cantabrian mountains. The canal enjoyed a short period of prosperity, especially in the export trade of flour from the northern Meseta to the Spanish colonies[12]. In the late nineteenth century the increase in competition from the railway, and the demise of the flour trade after the loss of the colonies in 1898, led to a decrease in traffic on the canal and the waters were used increasingly for irrigation schemes. Since 1955 all transport on the canal has ceased and the waters have been used exclusively by the Duero Hydrographic Confederation for irrigation purposes[13].

The development of irrigation policy

It was not until the end of the nineteenth century that any fresh attempt was made to develop the backward regions. Influential writers of the

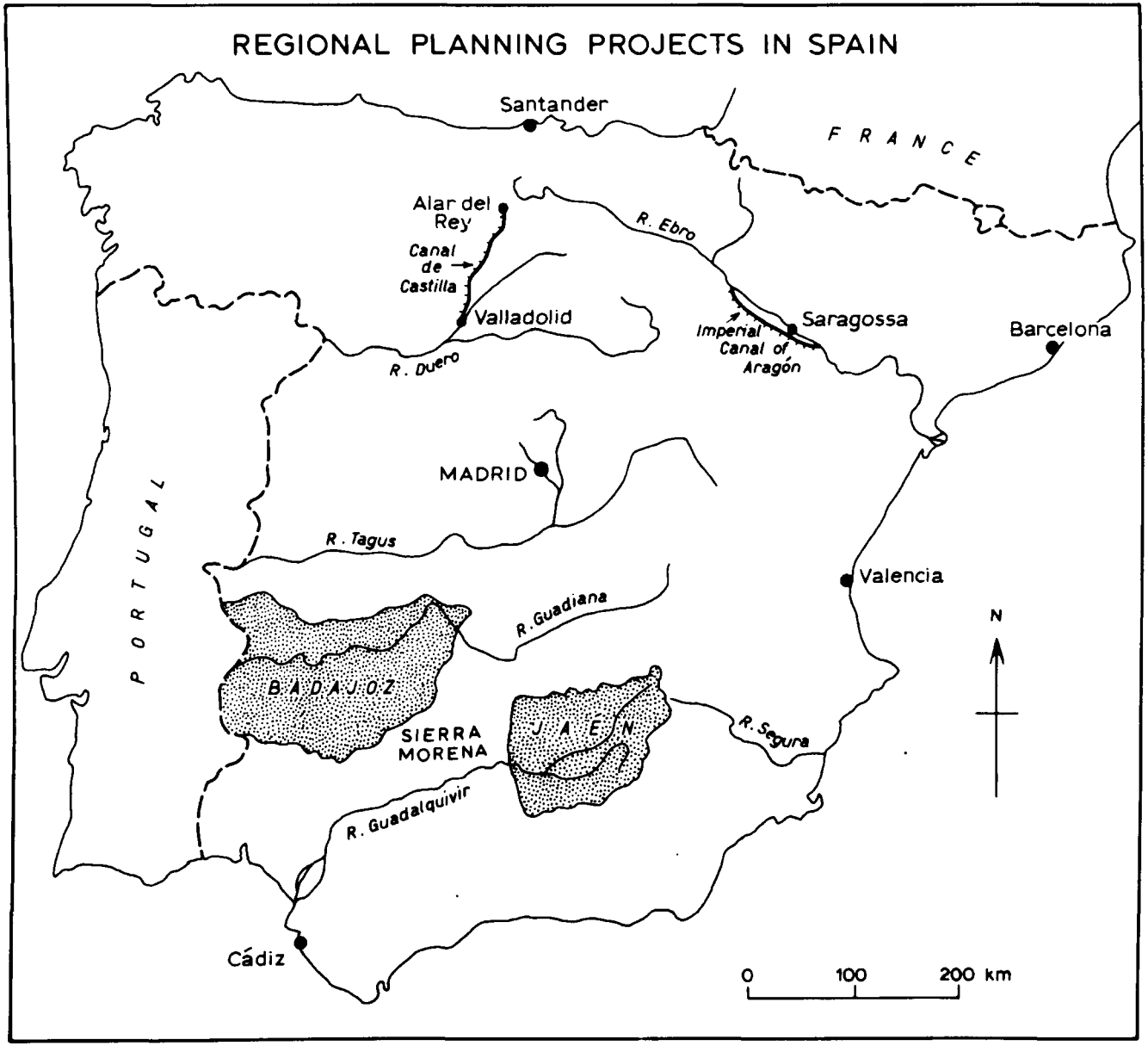
REGIONAL PLANNING PROJECTS IN SPAIN
Santander
FRANCE
Alar del Rey
Canal de Castilla
R. Ebro
Valladolid
Saragossa
Barcelona
Imperial Canal of Aragón
R. Duero
MADRID
PORTUGAL
R. Tagus
Valencia
R. Guadiana
BADAJOZ
SIERRA MORENA
JAEN
R. Segura
R. Guadalquivir
Cádiz
N
0
100
200 km

FIGURE 3:1

time such as Joaquín Costa and Macías Picavea pointed to the contrast in agricultural productivity between the regadío, Spain's rich irrigated lands, and the secano, the poor dry farming areas. Irrigation, it was argued, could be the panacea for rural poverty, an argument which was generally accepted in Spain. The development of Spain's irrigation policy can be seen in the progress of legislation during the period from 1870 to 1952.

The earliest legislation, the irrigation law of 1870, was essentially non-interventionist in character. The law gave the right to private companies to undertake large-scale irrigation works with the state giving no financial or other assistance[14]. This first law made very little impact in Spain and in a new irrigation law in 1883 the state recognised the need for giving a direct grant of 30% to private companies and 50% to communities of irrigators towards the cost of construction of the main hydraulic works.

Experience increasingly revealed the need for state intervention and in the irrigation law of 1911 the state became the main promoter and organiser of irrigation projects[15]. This process of increased state participation was to continue until 1949, when the state took over the remaining powers of private companies and assumed full authority for the management of irrigation and colonization schemes.

A second feature of Spain's irrigation laws has been the increasing recognition of the complexity of irrigation. The 1870 law referred only to the main construction works, the dams and principal distribution canals. In the 1883 law more emphasis was given to the secondary works, access roads and minor distribution canals, etc., and in the 1911 law to the re-afforestation of river basins, investigation into the most suitable crops and methods of cultivation, etc. By 1949 the state had accepted the need to administer every aspect of irrigation policy from the construction of public works to the selection and tutelage of the colonists for the new irrigated lands.

A third feature of the legislation has been the progression in scale from small local projects to the planning of entire valley regions. The emphasis on river valley development was largely the result of a long

campaign waged by a public works engineer, Laurenzo Pardo. Pardo's campaign was for a single authority that would manage an entire river basin and would be responsible for all aspects of a hydraulic scheme including irrigation, navigation, hydro-electric power generation, domestic water supply, etc. Pardo emphasized that these works should be fully co-ordinated in order to gain maximum benefit from a scheme. Although Pardo's principal aim was to increase the amount of irrigated land in Spain his proposals constituted a wholesale river basin development.programme. Pardo began campaigning for a river basin authority for the Ebro as early as 1906, but it was not until the dictatorship of Primo de Rivera in 1923 that he gained the attention of members of the government, especially the Minister of Public Works, the Count of Guadalhorce. On 5th March, 1926 a law was passed enabling hydrographic confederations to be established in all the major river basins in Spain. These confederations were semi-autonomous bodies governed by a large assembly consisting of representatives from various government ministries and over a hundred delegates from interested groups such as municipal authorities, hydro-electric power companies, farmers, etc. These assemblies established which major projects the confederations would undertake, whilst a smaller governing junta took care of the execution of the projects and the day-to-day running of the river basin. The first of the confederations was the Confederación Sindical Hidrográfica del Ebro created later on the same day, 5th March, 1926. This was the first water authority of its kind in the world and pre-dates the Tennessee Valley Authority by seven years. Subsequently other confederations were created, in 1927 for the Duero and Guadalquivir rivers, and in 1928 for the Segura, the rivers of the eastern Pyrenees and the Tagus (Figure 3:2). The Ebro remained the most important scheme, having created 72,163 hectares of new irrigated land by 1930, although almost all of this was supplied from existing dams[16]. The other confederations had hardly completed their preliminary studies when the government of Primo de Rivera fell on 26th January, 1930.

Contrary to common belief, interest in irrigation policy did not diminish after the fall of Primo de Rivera, indeed the governments of the Republic

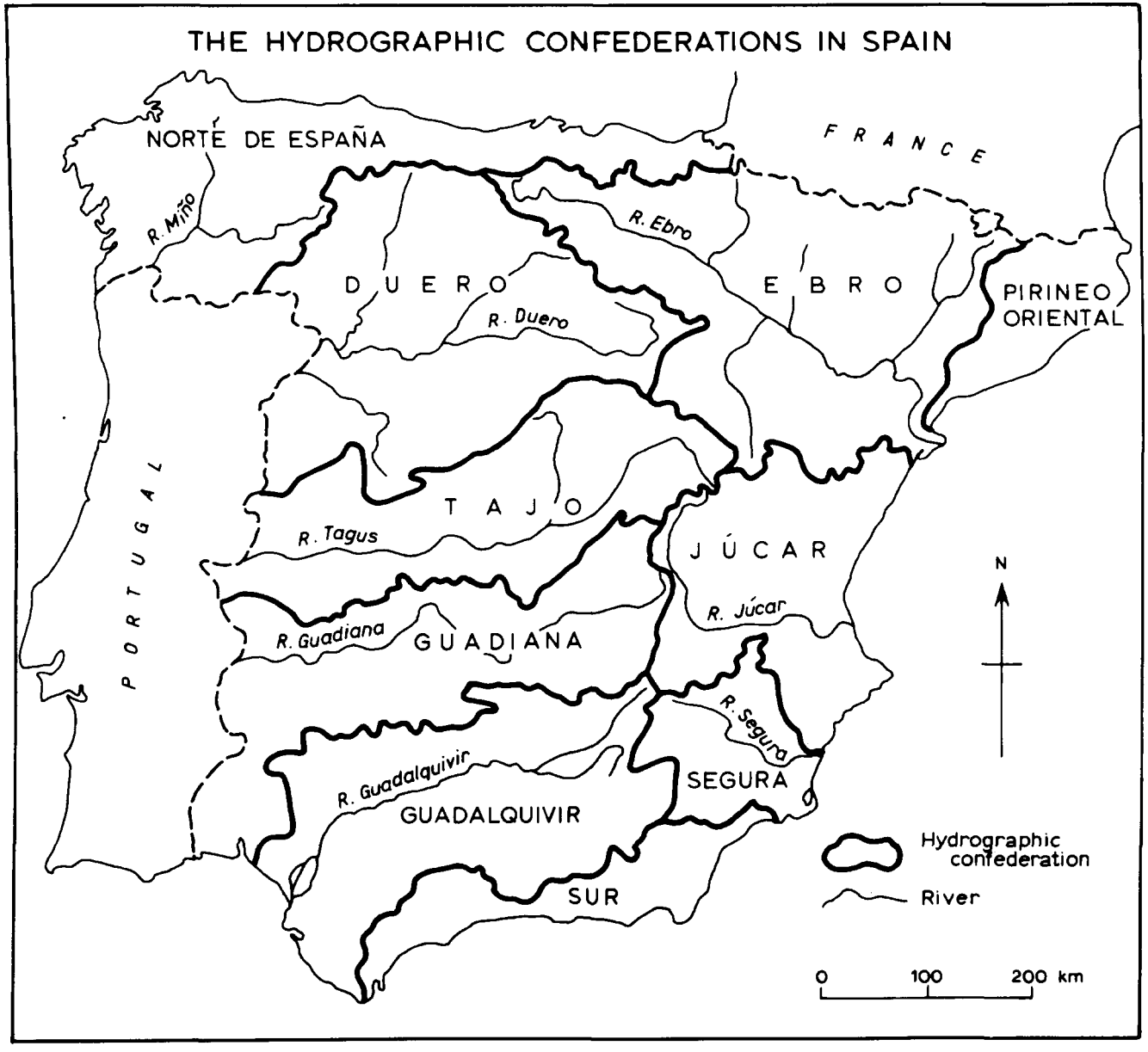
THE HYDROGRAPHIC CONFEDERATIONS IN SPAIN
NORTE DE ESPAÑA
FRANCE
R. Miño
R. Ebro
DUERO
R. Duero
EBRO
PIRINEO ORIENTAL
PORTUGAL
TAJO
R. Tagus
JÚCAR
R. Júcar
N
R. Guadiana
GUADIANA
R. Segura
SEGURA
R. Guadalquivir
GUADALQUIVIR
SUR
Hydrographic confederation
River
0
100
200 km

FIGURE 3:2

spent up to four times more per annum on irrigation projects than the governments of Primo[17]. However at the beginning of the Second Republic in 1931 everything connected with the Dictatorship of Primo, including the hydrographic confederations and Laurenzo Pardo were anathema, but by 1933 the Minister of Public Works, Indalecio Prieto, had revived the confederations and changed their name to mancomunidades (unions), and had appointed Laurenzo Pardo to take charge of the new Centre for Hydrographic Studies and to prepare a national plan of hydraulic works[18]. The main features of Pardo's new plan was to divert some of the headwaters of the river Tagus to the Segura valley in Murcia. The reason for this transference of water was the wide disparity in growing conditions between the two areas, the irrigated land of central Spain producing less than a third of that in the Levante. The scheme, like the rest of the agrarian reforms of the Second Republic, had insufficient time to take effect before the onset of the Civil War in 1936. However it is interesting to note that the Segura scheme was revived in 1966, and in 1974 forms the largest irrigation project under construction in Spain.

During the Second Republic concern was expressed at the slow rate of transformation of land from secano into regadío. In some areas irrigable zones remained under secano 20 years after the completion of the main dams and distribution canals. In part this was due to the technical difficulties inherent in any major hydraulic scheme. However the major difficulties came from the large landowners, the latifundistas and the local political bosses, the caciques, who opposed any reform that threatened their way of life or would loosen their hold over the peasantry. Two solutions to these problems were proposed. First a Servicio de Obras Puesta en Riego was created in 1932 with the authority to construct all the secondary works necessary to bring water from the main distribution canals to the farmlands. Secondly the idea of internal colonization was revived. The Agrarian Reform Law of 15th September, 1932 permitted the expropriation of 'surplus' secano land owned by latifundistas and its redistribution amongst colonists selected from landless peasants and farm labourers. The Vth National

Irrigation Congress held at Valladolid in 1934 proposed the extension of this practice to the irrigated lands, a proposal which was incorporated into all future irrigation projects. However these ideas had little time to take effect before the start of the Civil War.

Despite the violent change in political ideology, the Franco government of 1939 continued the irrigation policies of the Second Republic. Large hydraulic works were to be constructed by the state authorities, and the irrigable lands were to be settled by private societies of colonists supervised by the Instituto Nacional de Colonización (I.N.C.), a semi-autonomous body created in October, 1939. Little progress was made by these private societies and in 1949 the I.N.C. was given responsibility for all colonization activities including the promotion of new colonization schemes, research into methods for obtaining increased crop yields, etc.

The Badajoz and Jaén Plans

The development of an irrigation policy in the period from 1870 to 1949 made possible Spain's first attempts at large-scale integrated regional planning, the Badajoz and Jaén plans of 1952 and 1953. In the early 1950's Badajoz and Jaén were two of the most backward provinces in Spain. In terms of per capita income in 1955 Badajoz and Jaén were, respectively, the 44th and 47th poorest regions in Spain[19]. Both provinces were over-dependent on agriculture which, in 1950, employed over 70% of Badajoz's and 69% of Jaén's active population. Both provinces were characterized by latifundios, with large areas given over to the cultivation of olives, wheat, other cereals and rough pasture lands. Large amounts of labour were required for small amounts of time, causing widespread seasonal unemployment. The social problems, such as poor housing conditions, low incomes and high illiteracy rates were amongst the worst in Spain.

The plans for both areas included a vast programme of public works. In Badajoz province this involved the construction of five main dams and four smaller dams on the river Guadiana and its tributaries, and in Jaén province the construction of six dams on the upper reaches of the river Guadalquivir. Both plans included colonization schemes for the new irrigation zones. By

1971 the main hydraulic works in both plans had been completed, representing a considerable technical achievement. In Badajoz 89,056 hectares of irrigated land and 41 new I.N.C. villages had been created, and in Jaén 20,307 hectares of irrigated land and 22 new I.N.C. villages[20]. Both plans include re-afforestation schemes, industrialization and electrification projects, etc., and they can be considered as the direct descendants of Pardo's confederations, except in one important respect. For administrative convenience both plans apply only to the provinces of Badajoz and Jaén and not to the river basins of the Guadiana and the Guadalquivir (Figure 3:1). However as the two provinces contain the major portions of these river basins, no great difficulties have occurred in practice.

One major criticism can be levied at the two plans. Both were aimed at alleviating the economic and social backwardness of their provinces, and yet despite considerable technical achievements and the vast expenditure both provinces are still amongst the poorest in Spain. Indeed Badajoz and Jaén appear to have fared little better than other provinces suffering from similar problems but not endowed with large irrigation schemes. The ability of the two plans to promote regional development has depended on two factors: the ability to create extra jobs and to raise per capita output. In the early 1950's the huge army of unemployed caused overriding priority to be given to the first factor. This was reflected in article 10 of the colonization law of 1949 which stated that it was the main aim of the I.N.C. to install the largest possible number of colonists on the irrigated lands. As a consequence of this policy the number of colonists on the regadío lands rose to over seven times the number of farm workers on secano land. However, this was only achieved by giving each colonist a reduced plot of land, so that net production per farm worker was no higher on the regadío than on the secano[21]. Thus by pursuing the first factor, the second factor, raising per capita output has been sacrificed.

As a solution to the problem of rural unemployment the Badajoz and Jaén plans have been of minimal effect. The number of new colonists involved in either plan remains very small. By 1971 there were only 5,419 colonists in

the Badajoz plan, and 2,069 colonists in the Jaén plan. These numbers could have been considerably higher but for the official policy of allowing existing private landowners in irrigated zones to continue holding a large proportion of their lands. Only land then 'in excess' has been used for new colonization. As a consequence I.N.C. colonists only occupy 32% of the new irrigated areas[22]. Including workers in the new industries, of which there were 6,628 in Badajoz and 9,087 in Jaén, the total employment created by the plans by 1971 was 12,047 in Badajoz and 11,156 in Jaén. These are very small numbers out of the total population of 818,000 in Badajoz and 781,000 in Jaén in 1950. In comparison mass out-migration has made a much greater impact on rural unemployment. Over the period 1951-1970, Badajoz lost 214,794 persons and Jaén 264,751 in net out-migration[23].

The Badajoz and Jaén plans have formed the standard pattern for the many subsequent irrigation and colonization schemes which now exist in almost every region of Spain[24]. The engineers and agronomists who were given control of these plans have achieved a considerable degreee of technical success, but they have given little consideration to the financial costs. In general these plans have been expensive, slow in coming to fruition, limited in effectiveness, and have not provided an efficient means for developing Spain's backward regions. These conclusions were strongly emphasised in the World Bank report of 1963 and the World Bank/FAO report on the development of Spanish agriculture of 1966[25].

Both reports strongly recommended that a careful investigation be made of the costs and benefits to be obtained from each of the projects then under construction and that work should continue only on those projects where more than 50% of the investment had been made, and where the investment was less than 50% in those cases where, a) there was likely to be a high return on the remaining capital to be invested, b) where the project would have a strong effect on the balance of payments, and c) where the project would create much employment or bring other social benefits. These criteria were incorporated into the first National Plan, and yet as the 1966 report points out they were to result only in a very marginal reduction in the

number of projects under construction. The pro-irrigation lobby, mainly in the Ministry of Agriculture and Ministry of Public Works was able to preserve most of their schemes intact and in the case of the Tagus-Segura scheme, were able to embark on an entirely new and costly project (see below).

New Developments in Regional Planning During the 1950's

At the beginning of the 1950's it was widely believed by government officials that scarcity of annual rainfall was the main cause of poverty in Spain and that irrigation could provide the means for developing the backward rural areas. This point of view was ably summarised by J.M. Houston in his 1950 paper "Irrigation as a solution to agrarian problems in modern Spain"[26]. Towards the end of the 1950's the limitations of irrigation as a development policy had become apparent and the government began to investigate other means for developing the backward regions, including the planes provinciales and the ordenación rural scheme.

The ordenación rural scheme was started as a direct result of experience gained during the land consolidation programme of the 1950's. In February 1953 the Servicio Nacional de Concentración Parcelaria (S.N.C.P) had been created to tackle the problem of fragmented farm holdings[27]. This in itself was an important event being the first major attempt to solve the problems of the minifundio areas. Land consolidation has been applied at the municipio (parish) level and those municipios so treated have shown considerable benefits in terms of increased efficiency, higher crop yields and higher agricultural income[28].

As a result of the experience gained during the first ten years of land consolidation it was decided to extend the S.N.C.P. to include ordenación rural. The main aim of ordenación rural, as stated in the Decree of 2nd January, 1964 is

> "to raise the standard of living of the agrarian population through the integrated transformation of zones and by giving adequate stimulants to improve agrarian structures"[29].

Ordenación rural is intended for use in areas where minifundios predominate although there is no legal restriction to these areas, and in theory it could

be applied in other areas as well.

Ordenación rural schemes may include some or all of the following:-

a) the redistribution of property into economically viable holdings,

b) an increase in the implementation of land consoldiation schemes,

c) the promotion of group agricultural activities such as co-operatives and other types of associations,

d) the promotion of farm modernization through mechanization, improved installations, etc.,

e) the execution of earth-levelling schemes, plantations, etc. which preserve the natural resources of the zone,

f) the improvement of cultivation techniques and practices to raise agricultural output,

g) the promotion of agricultural industries and other activities that create employment,

h) the improvement of technical training and the general raising of cultural and educational levels amongst the agrarian population[30].

The need for ordenación rural has been described fully by the sociologist M. Siguán Soler. In a survey undertaken for the S.N.C.P.O.R. Siguán made a very detailed study of the economic, social and psychological problems of rural Castile and pointed out the possibilities for ordenación rural, what improvements it could make, what difficulties it would face and how these difficulties could be overcome[31]. Siguán's study has greatly influenced the development of ordenación rural in Spain.

The ordenación rural programme contains two important innovations which are of interest to an account of the history of regional planning in Spain. The first innovation has been the recognition that raising the standard of living of the agrarian population would require more than the basic reform of farm properties. Improved services, improved infrastructure, better schools, etc. are all required in order to provide an adequate standard of living in the rural areas. This recognition has been borne out in practice. For example an ordenación rural study of the La Bureba district of Burgos found that there was a high level of outmigration not through any lack of

possibilities for economic growth in the district, but because people were living in inadequate and often intolerable conditions.

The second innovation is that ordenación rural represents the first essay into planning at the scale of the comarca (district) in Spain. This has arisen from the need to work at a scale larger than the municipio but smaller than a province. There is a need to plan the improvements of several villages jointly, especially as it is possible only for certain 'selected villages' to receive an adequate level of services.

Although the ordenación rural programme is a welcome new departure in regional planning, it has been criticised on a number of counts. The World Bank/F.A.O. study of thedevelopment of agriculture in Spain suggested that ordenación rural be limited to those areas where rural poverty is due to inadequate infrastructure, etc. and not where it is due to poor soils or a harsh climate. That is to say the study suggested that the service be more selective in the types of comarca chosen for ordenación rural[32].

The programme also has been criticised for being too timid in its approach and methods, and for being dominated by the land consolidation scheme[33]. Ordenación rural is being run as an agricultural advice and improvement service, when to be successful it needs to be run as a full economic and social development service giving more emphasis to better housing, water and electricity supplies, etc. However this would require the active participation of ministries other than the Ministry of Agriculture, and a level of ministerial co-ordination higher than is normal within Spain.

In 1946 the government created a series of Juntas Provinciales de Ordenación to study the possibilities for growth and development in all the Spanish provinces. This represented a new departure in policy, being the first regional development programme in Spain that was not based on land improvement. During the twelve years 1946-1958, over fifty planes provinciales were completed, but these were mainly studies and little of practical significance was achieved[34]. In 1958 the planes provinciales were given the responsibility for improving the "socio-economic infrastructure" of the Spanish countryside, and over the period 1958-1970 over 24,800 items of

work under this policy were completed. The majority of these schemes involved the improvement of roads, water and electricity supply, drainage, and the telephone service. In the latter part of this period the planes provinciales have followed the practice of the ordenación rural service and concentrated improvements in the main villages and centres of a region, so that at least in the selected villages there would be a level of public services adequate for the 1970's[35]. Economists have recognised the difficulty of assessing the contribution made by this type of scheme on the process of regional development[36]. In Spain, although the planes provinciales have brought considerable benefits to the rural areas, by themselves they have not been able to stimulate the rural economy and appear unable to stop large areas of Spain from becoming depopulated. During the period of effectiveness of the planes provinciales, the 1960's, over two-thirds of Spain's parishes, the municipios, suffered an absolute loss in population.

In 1958 the economic council of the national trade union movement, the Sindicatos, created a Gabinete Técnico composed of economists, statisticians, agronomists, etc. This group carried out a series of studies on the social and economic state of each of the fifty provinces of Spain, much of the information coming from the Sindicato's own experts in the provinces. This series of studies was completed by 1963 and represents the first comprehensive survey of the problems of the various regions of Spain and the possibilities for their future development. These studies were much used by the World Bank Mission and later by the technocrats involved in setting up the first national economic and social development plan. Because of the great value of these studies the Sindicatos were asked to repeat the survey in the early 1970's, a task which should be completed during 1974. In the mid-1960's the Sindicatos also began a series of regional studies, but this time based on natural regions rather than the administrative areas of the provinces. Several of these regional studies have led to subsequent plans, notably for the regions of the Tierra de Campos, the Camp de Gibraltar and the South-East region of Spain. In sum the Sindicatos,

although not involved in the organisation of regional planning in Spain, by their researches and publications have played an important role in its development.

Regional Planning and the National Plans

The economic growth of Spain during the 1950's and early 1960's brought about fundamental changes to the structure of Spanish society and altered the whole framework within which regional planning operated. First, as large numbers of people migrated away from the poor rural areas, so they reduced the need for large-scale rural development schemes. By the late 1960's the pressure of population on the land had fallen considerably and in some rural areas there was even a shortage of labour. Secondly, by the start of the first National Plan in 1964 it had become feasible to consider industrialization as an alternative method for promoting the less developed parts of Spain.

Regional planning has been included as an integral part of the National Plans. Regional development, it is thought, can make a significant contribution to national development.

In the first National Plan of 1964-1967 the objective of regional planning was stated as 'securing the balanced participation of all the geographic regions in the economic and social well-being of the country'. This was to be achieved by four methods:- i) the creation of industrial growth poles in areas of low income, ii) assuring the better use of resources and promoting local initiatives by financial incentives and joint projects, iii) intensifying the various agrarian reform programmes, iv) by guiding internal and external migrations according to the needs of economic development[37]. However in practice attention has been concentrated on the first method, the development of industrial growth poles.

Under this policy industry was to be promoted in seven towns located in the backward regions (Figure 3:3). Of these towns five; Corunna, Vigo, Seville, Saragossa and Valladolid, the Polos de Desarrollo, had an existing industrial base, whilst two; Burgos and Huelva, the Polos de

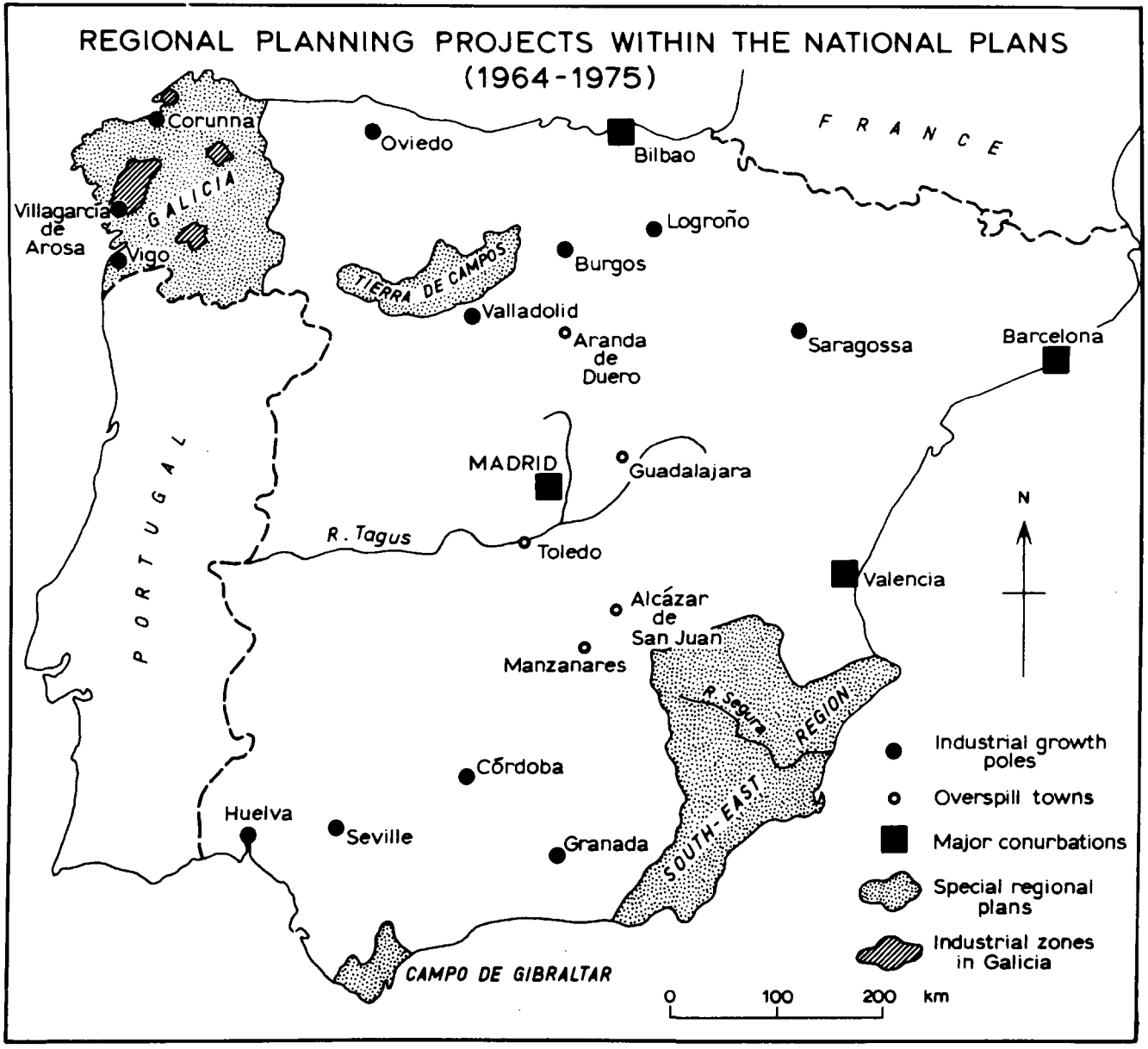
REGIONAL PLANNING PROJECTS WITHIN THE NATIONAL PLANS
(1964-1975)
Corunna
Oviedo
Bilbao
FRANCE
Villagarcia de Arosa
GALICIA
Vigo
Logroño
Burgos
TIERRA DE CAMPOS
Valladolid
Aranda de Duero
Saragossa
Barcelona
MADRID
Guadalajara
PORTUGAL
R. Tagus
Toledo
Valencia
Alcázar de San Juan
Manzanares
R. Segura
REGION
SOUTH-EAST
Córdoba
Huelva
Seville
Granada
CAMPO DE GIBRALTAR
N
Industrial growth poles
Overspill towns
Major conurbations
Special regional plans
Industrial zones in Galicia
0
100
200
km

FIGURE 3:3

Promoción had no important industry. The industrial expansion of these seven growth-poles is to be achieved entirely through private enterprise, attracted to the poles by economic benefits granted by the state. The benefits vary from time to time, can change with the size and importance of the firm to be attracted, and are generally higher in the Polos de Promoción than in the Polos de Desarrollo. Under the second and third National Plans of 1968-71 and 1972-75, some of the original growth poles are being phased out and new growth poles established (Figure 3:3), there being no more than seven growth poles at any one time (Table 3:1).

Although the growth-pole scheme forms the main element in the regional development programme of the National Plans, in recent years attention has also been given to a series of special regional plans. Whilst the growth poles are regarded as a general panacea for underdevelopment, these regional plans have been designed to meet the specific requirements of a particular underdeveloped area. Most of these plans have their origins in the Sindicato's regional studies of the early 1960's. The first of the regional plans was for the Canary Islands, and was introduced as an integral part of the first National Plan in 1964.

The Canary Islands have a number of specific problems and some unique advantages which give them a pattern of economic development distinct from the rest of Spain. Agriculture is limited by a shortage of water which is quite severe in the islands of Lanzarote and Fuerteventura; by sharp changes in relief particularly on the islands of Tenerife, La Palma and Gomera; and by the existence of poor soils in various parts of all seven of the islands. Industrial development is limited by the small local market, by the high cost of transport to the main Spanish market, and by the complete absence of raw materials. However the islands also enjoy certain advantages, notably a very benign climate suitable for the cultivation of early crops and for tourist activity all the year round, and an ideal location to take advantage of the important mid-Atlantic fishing grounds.

Because of these distinctive economic features it was thought that a national plan designed to meet the needs of mainland Spain would not be

TABLE 3:1

Duration of Each of the Growth-Pole Schemes.

| Growth Poles | Date of Inauguration | Date of Termination |
|---|---|---|
| Burgos | 1 - 2 - 1964 | 31 - 12 - 1974 |
| Huelva | 1 - 2 - 1964 | 31 - 12 - 1974 |
| Corunna | 1 - 2 - 1964 | 31 - 12 - 1971 |
| Seville | 1 - 2 - 1964 | 31 - 12 - 1970 |
| Valladolid | 1 - 2 - 1964 | 31 - 12 - 1970 |
| Vigo | 1 - 2 - 1964 | 31 - 12 - 1971 |
| Saragossa | 1 - 2 - 1964 | 31 - 12 - 1969 |
| Granada | 1 - 1 - 1970 | 31 - 12 - 1979 |
| Córdoba | 1 - 1 - 1971 | 31 - 12 - 1980 |
| Oviedo | 1 - 1 - 1971 | 31 - 12 - 1980 |
| Logroño | 1 - 1 - 1972 | 31 - 12 - 1981 |
| Villagarcía de Arosa | 1 - 1 - 1972 | 31 - 12 - 1981 |

Source: Planning Commission, Desarrollo Regional, Madrid (1972) p.271.

suitable for the Canary Islands and so a separate development plan was prepared. However, each of the seven main islands are very distinct one from another, both in terms of physical characteristics and in potential for economic growth. As a result the plans for the Canary Islands have included lists of measures to suit the particular needs of each island.

Despite this complexity certain sectors have been given special attention in all seven islands. In the first plan for the islands the three sectors with the highest potential for growth, agriculture, fishing and tourism, were encouraged[38]. These three sectors continued to be encouraged in the second and third plans although more attention was given to diversification of the island's economy, in particular through industrialization[39]. The main factor limiting economic development in all seven islands is the lack of a sufficient and regular water supply. To overcome this problem a hydrological study, SPA-15, sponsored jointly by the Spanish government and Unesco, has been established to survey the existing water resources of the islands and to produce a hydraulic plan which will rationalize and improve the water supply situation[40]. However in essence the plans for the Canary Islands are general investment programmes designed to cater for all aspects of the Canary Islands' economy, rather than a coherent regional development plan based around some particular improvement policy or reform scheme.

The second of the regional plans applies to the Tierra de Campos region of the northern meseta (Figure 3:3). The Tierra de Campos is a predominantly agricultural area which has a fairly harsh climate with very cold winters and hot summers, and is also an area of very poor soils. However the greatest difficulties arise from the minifundios, which are the predominant form of landholding in the area. The Tierra de Campos plan relies heavily on work done earlier for the Sindicato regional study. The plan, which was inaugurated on 23rd September 1965, proposes to transform the whole economic structure of the region with special emphasis being given to agricultural improvements. Notable features of this plan

are the proposals to irrigate 103,900 hectares of secano land, to apply land consolidation to all the minifundios of the region, to promote new types of farming enterprise especially dairying, and to promote those industries processing agricultural produce[41]. However the plan is not just an economic programme, it also represents an attempt to break the social stagnation of the region and to give it a new and viable way of life. For this reason investment has been channelled into 28 selected villages and small towns to improve the physical, cultural and urban services of these places so that they at least attain a reasonable standard of living.

The results of the Tierra de Campos plan so far have not been encouraging. There has been only a very small increase in the amount of land under irrigation. Very little progress has been made with industrialization. The selected villages have not yet had any significant effects on their surrounding areas[42], and there has been no appreciable rise in the standard of living in the region[43]. The principal cause of these poor results has been the low level of investment in the plan. By 1971 the level of investment was less than 50% of that proposed in the original plan[44].

The third of the regional plans to be inaugurated during the first National Plan was for the Campo de Gibraltar (Figure 3:3). Although the Campo de Gibraltar is one of the poorest and most depressed areas of Spain, the development plan was introduced not for economic reasons but as a new political factor in the quarrel with Britain over the future of the Rock of Gibraltar (Naylon, 1972). The Spanish government intends to create a prosperous conurbation around the bay of Algeciras such that the people of the Rock will wish to be permanently linked with the Spanish mainland. The Campo de Gibraltar plan, which also springs from an earlier Sindicato study, is a plan to develop the general economy of the area and includes new tourist zones, agricultural reform schemes, but with most emphasis being given to new industrial developments. Notable features of this industrial programme include a four million tons capacity oil refinery, a large stainless steel plant and various food product and paper product

firms[45]. The plan so far has had a chequered history, the largest single employer, the textiles firm Confecciones Gibraltar S.A. went bankrupt in 1970, nevertheless for overriding political reasons the plan will not be allowed to fail. However the Campo de Gibraltar plan still has a long way to go before reaching its goals. At the beginning of 1972 3,946 jobs had been created, but this total was still far short of the approximately 7,000 workers who had previously been employed on the Rock[46].

The second National Plan, 1968-1971 saw a straightforward continuation of the regional planning programme of the first Plan. The third National Plan, 1972-1975 has seen a further continuation of these policies, but with the addition of two more special regional plans. The first of these, is for the South-East Region of Spain comprising the four provinces of Albacete, Alicante, Almería and Murcia (Figure 3:3). The main feature of this plan is a large hydraulic scheme for the transfer of water from the headwaters of the Tagus to the Segura valley on the Mediterranean coast (Figure 3:3). It is estimated that when completed this scheme would transform 300,000 has. into new irrigated lands and improve the supply of water to 80,000 has. of existing irrigated lands[47]. The plan also contains proposals for developing the industrial base, transport facilities, and urban services of the region, particularly for those areas not directly affected by the irrigation scheme. The other plan applies to the four provinces of Galicia (Figure 3:3). This, like the plan for the Canary Islands is a general plan for all sectors of the economy and is not based around one specific project. Notable features of the Galicia plan include the attempt to promote dairying and inshore fishing in various parts of the region, the construction of a motorway link with the rest of Spain and completion of the El Ferrol-Gijón railway. However the most important feature is the construction of new industrial estates in two areas along the coastal strip from El Ferrol to Pontevedra, and around the interior towns of Lugo and Orense[48].

The Management of Territory Policy

From a geographer's point of view the most interesting innovation of

the third National Plan has been the introduction of the policy of vertebración del territorio or management of territory. This new policy starts with the assumption that cities are the principal proponents of political, social and economic change within a nation. The major metropolitan areas are seen as the principal centres for the diffusion of innovations, and the process of economic development is seen as intimately connected with the system of cities and their spatial structure. The policy of vertebración del territorio is an attempt to reach an optimum urban system that will maximise each city's contribution to the national income.

The concept of territory management is not entirely new in Spain. In the first National Plan five poligonos de descongestion or overspill towns were designated around Madrid (Figure 3:3), although except in the cases of Guadalajara and Aranda de Duero no real progress has occurred. Under the new policy the planners first task has been to recognise and establish the hierarchical system of cities within Spain together with the hinterlands of these cities, by such methods as the use of gravity models[49]. The objectives of vertebración del territorio include maximising national income, equalizing standards of living throughout the country, and giving special assistance to the most dynamic metropolitan regions. Applying these objectives to the Spanish system of cities the planners have established a list of works including investment in transport, housing, new urban developments, etc. for each major urban centre in Spain.

This new policy is still in a stage of exploration rather than application, and it makes a large number of unsubstantiated assumptions, especially on the link between urban systems and economic growth. Nevertheless it represents a worthy attempt to come to grips with the basic forces underlying economic growth in Spain.

Conclusions

In Spain regional planning has progressed from being a neglected feature of government policy to playing a prominent role in the National Plans. At the same time the techniques of regional planning have been

considerably refined, although they are still capable of further improvement. There has been an unfortunate tendency towards introducing new plans rather than reinforcing the prosecution of existing programmes. For example if more attention had been given to the growth poles of Corunna and Vigo (See Chapters 10 and 13 below) then the regional plan for the Galicia would not have been so urgently required. To date there has been no attempt to assess the varying merits of each of the different types of regional plans currently in operation in Spain. Each plan is assessed on its own merits, rather than as one alternative amongst several possible plans. For example the hydraulic plan has become an end in itself, rather than an alternative method for improving regional income. More harmful still has been the power of vested interests to promote certain types of regional plan. The possibility that large areas will be converted into irrigated land depends not so much on the profitability of such schemes, - indeed as J. Naylon has pointed out these schemes are financially disastrous[50] - but on the considerable ability of vested bodies such as the I.N.C. and the Ministry of Public Works to command a large share of the national budget.

During the early 1960's the limitations of the irrigation and colonization programme as a means for transforming backward rural areas had become apparent. The main aim of this programme, to establish as many new colonists as possible on the land, has been a conspicuous failure:

> "At the end of 1967, after 23 years of activity, the I.N.C. had settled a total of 49,484 colonists - an average of 2,151 per year for what is claimed with some justification to be the biggest land-settlement programme of its kind in the world"[51].

By 1964 it was realised that industrialization was likely to be a far more efficient method of creating employment and promoting regional development than expensive agricultural reform programmes[52]. For this reason the first National Plan gave great emphasis to the establishment of industrial growth poles in the less developed areas of Spain. Despite the recent proliferation of special regional plans, the growth-pole scheme remains the main policy for promoting Spain's underdeveloped regions.

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## Chapter 4

# THE COMPONENTS OF ECONOMIC DEVELOPMENT - A FACTOR AND CLUSTER ANALYSIS OF DEVELOPMENT IN SPAIN

## Introduction

The purpose of this chapter is to examine in detail the nature of economic development in Spain. An analysis is made of 45 variables thought to be significant in the process of economic development and, through the use of factor and cluster analysis, an attempt is made to identify and differentiate the underdeveloped regions of Spain.

Surprisingly there have been very few studies in Spain concerned with identifying the underdeveloped regions on a national scale. The official studies by the Gabinete Técnico of the Sindicatos or by the Planning Commission have investigated the problems of particular provinces or regions, and private studies such as those by Capelo Martínez[1] on Andalusia or J.M. Beiras[2] on Galicia similarly have been concerned with particular problem areas, but no overall survey of development has ever been made. The one exception is the study by Professor Sampedro[3] of the economic 'profiles' of the regions of Spain. However, Sampedro's study is fairly limited in scope, both in the smaller number of variables used and because his regions were chosen subjectively rather than by the use of analytical procedures.

## The Nature of Underdevelopment

During the 1950's it was commonly believed that a nation or region remained underdeveloped because it lacked some ingredient vital to the process of economic growth. Economic theory suggested that if only an area had sufficient capital, or sufficient employment etc., then economic growth would proceed as a normal and natural process. Practical experience during the 1950's and 1960's and the results of further academic research have all stressed the underlying complexity of the development process. For example, in Lengyel's book Approaches to the Science of Socio-Economic Development,

which is a collection of readings from a wide variety of authors dealing with very different cultural backgrounds, all the contributors stress the diverse and heterogenous nature of development. More recently it has been suggested that the rate of economic development is linked to the change from a peasant culture and peasant mentality to a modern industrial and urban outlook. However, Schnore[5] has shown that our measures of industrial and urban development are highly intercorrelated and appear to reflect a single underlying dimension which he termed 'modernization'.

Modernization has been defined as

> ".... the process by which individuals change from a traditional way of life to a more complex, technologically advanced, and rapidly changing style of life".[6]

It is recognized that there are many forms of peasant mentality and much cultural variation in peasant life-styles even within a single nation such as Spain. E.M. Rogers has surveyed[7] many of the elements associated with underdevelopment in peasant societies and has come to the conclusion that modernization is not one process but a whole collection of interlinked processes. Thus it is not possible to find a single index of modernization, but rather a number of indices which together give an estimation of the level of modernization. A similar conclusion was reached in the United Nation's 1961 Report on the World Social Situation which established a 'development index' based on 18 intercorrelated variables derived from 73 social indicators[8]. Modernization is seen as a many variable problem and therefore suitable for analysis by multivariate techniques, especially factor analysis.

Attempts have been made to extend the concept of modernization into a fully fledged sociological theory of development. These attempts have not been altogether successful and Bernstein provides a comprehensive survey of the criticism which has been levelled at these theories[9]. However Bernstein, like Weiner and many other social scientists...

> "persist in using the term (modernization) not only because it is a part of popular speech, but also because they recognize

> that these many changes (in individual attitudes, in social behaviour, in economics, and in politics) are related to one another".[10]

Thus criticisms have been levelled at specific sociological theories based on modernization, but not at the concept of modernization itself.

A large number of studies of socio-economic development have used factor analysis procedures, usually as an exploratory technique. Many of these studies have been listed by Harman[11] and by Rummel[12]. Typical of these studies is the work of Roberts and McBee[13] who used factor analysis to establish the link between modernization and economic development in Mexico, and Kahl who used factor analysis to measure and compare 'modernism' in Brazil and Mexico[14].

Multivariate techniques have also been used by geographers to study the spatial aspects of economic development. One of the earliest of these studies was by B.J.L. Berry[15] who used factor analysis in a survey of international patterns of development. Other important works include the study by Thompson et al: of 'economic health' in New York State[16], B.J.L. Berry's study of rural poverty in rural Ontario[17], and D.M. Smith's identification of the 'grey' areas in North West England[18].

The Factor Analysis Model

Factor analysis is a method of searching for regularities or structures within a set of variables. This is achieved by replacing measurements on the observed variables by a lesser number of hypothetical or latent variables, termed factors. The factors are obtained by extracting the eigenvalues and eigenvectors from the variance-covariance or correlation matrix, and then scaling the eigenvectors. The factor or factors are thought to represent the 'hidden dimensions' of the data set which otherwise remain obscured or are not directly measurable. For example in our study of socio-economic development in the provinces of Spain a large number of indices of development are used. However, these indices are inter-connected because they are all thought to be controlled, to a greater

or lesser extent, by a common external factor termed 'modernization', but which is not directly measurable. Thus it is argued that there is a factor which influences all the indices and which may be termed the common factor and factors which influence each specific index which may be termed the specific factors. The correlations amongst the indices are thought to be due to the common factor, and these correlations give an indication of the importance of the common factor in determining variation in the indices. Thus if there is a high positive correlation between two indices it can be argued that this is due to a similar high level of 'modernization' contained in both indices. However, each test would also have a specific aspect associated with it which accounts for the lack of perfect correlation.

The techniques used to obtain the factors have been the subject of considerable controversy and debate. This debate has occurred within the technical press in journals such as Psychometrika, and in the geographical press as in the recent exchange between P.M. Mather and W.K. Davies in Area[19]. However, many of the technical objections to factor analysis are met in part, if not in full, by the methods used here and described by Kaiser[20]. A more fundamental criticism of factor analysis is that without the correct theoretical background the method can produce meaningless results. For example, Armstrong has shown that by feeding in a number of mineralogical variables meaningless factors are obtained[21]. Similarly Davis warns against the undiscriminating use of factor analysis in geological studies, claiming that 'many .... factor studies of geologic data have led to trivial results'.[22] For this reason special care has been taken in the selection of variables used in the analysis, which is discussed below in some detail. Similarly the interpretation of the results has been made within the context of existing theories of socio-economic development.

The Factor Analysis Procedures Used in This Study

J. Tukey, in his now classic survey of data analysis, makes the distinction between exploratory and confirmatory studies[23]. All data analyses occur somewhere along a continuum defined by these two extremes. In confirmatory studies much is already known and the analysis is used to confirm or reject one, or several, clearly defined hypotheses. In exploratory studies a great deal less information is known and so a far wider group of variables is examined in the belief that they may be relevant to the study in hand. This latter approach has been criticised by several authors, for example King[24] and Davis[25], for representing nothing more than a statistical 'fishing expedition', dangling a line in the hope of pulling out something significant. Nevertheless other writers, notably Tukey[26] and Kaiser[27], have argued that there are many situations, particularly in the social sciences, which require a 'reconnaisance' or general survey approach. In these situations exploratory factor analysis will, in Kaiser's words, enable researchers .... "almost certainly to come away wiser, if not wise".

Many different factor analysis models have been constructed. Because of the nature of the Spanish study a model suitable for exploratory work was chosen. This was Kaiser's Little Jiffy Mark IV[29], which is probably the most advanced general factor analysis model in existence at the time of the study. Kaiser's Little Jiffy is based on Guttman's image factor analysis[30] where the common variance is estimated by the squared multiple correlation co-efficient of each variable with the remaining variables[31]. In 1962 Harris[32] modified Guttman's original model by use of a proportionality constant which makes the model scale-free. Scale-free matrix transformations yield factors that are invariant of the scales used in measuring the original data. This is important because it overcomes the problem of scaling of the variables. Natural measures rarely exist in the social sciences, and other methods of factor analysis yield differing results for differing scalings.

The problem of selecting the number of factors to be extracted is met by taking only those factors with associated eigenvalues greater than one. In practice this means excluding factors which do not contribute to total variance as much as one of the original variables does. This solution gives the same result as Guttman's algebraic criterion, the weaker lower bound[33]. The second major problem in factor analysis, the question of which transformation or rotation to use is met by using an oblique rotation, the independent cluster 'orthoblique' solution[34]. This is regarded by Kaiser, on the basis of empirical examples, as being the best, if not the definitive solution to the transformation problem[35].

Kaiser has introduced two important innovations into his 'Little Jiffy' models. The first is an 'Index of Factorial Simplicity' which assesses the simplicity of the transformed pattern matrix and its possible distortion from an ideal simple pattern[36].

$$I.F.S. = \left[ \frac{\sum_j \left[ q \sum_s v_{js}^4 - \left( \sum_s v_{js}^2 \right)^2 \right]}{\sum_j \left[ (q-1) \left( \sum_s v_{js} \right)^2 \right]} \right]^{\frac{1}{2}}$$

where $q$ is the number of factors, and $V_{js}$ is an element of the transformed Harris eigenvectors. This index is based on Thurstone's simple - structure concept[37] which states that from the point of view of interpretation, each factor should be as simple as possible. In practice this means that it is better to have each factor defined by the smallest possible number of

TABLE 4:1

Assessment of the I.F.S. and M.S.A. scores

| | |
|---|---|
| in the .90 s | marvellous |
| in the .80 s | meritorious |
| in the .70 s | middling |
| in the .60 s | mediocre |
| in the .50 s | miserable |
| below .50 | unacceptable |

variables, and that each variable should be associated, as far as possible, with only one factor. Kaiser's I.F.S. scores range between zero and one, where zero indicates the complete absence of that variable in a factor, and one the complete presence. Kaiser, on the basis of extensive empirical work, has subjectively evaluated the I.F.S. scores as shown in Table 4:1.

Kaiser's second important innovation is a 'Measure of Sampling Adequacy', which measures the adequacy of data for factor analysis purposes.

$$M.S.A. = \frac{\sum\sum_{j \neq k} r_{jk}^2}{\sum\sum_{j \neq k} r_{jk}^2 + \sum\sum_{j \neq k} q_{jk}^2}$$

where $r_{jk}$ is an original correlation and $q_{jk}$ is an anti-image correlation or correlation between the specific parts of the variables[39]. The M.S.A. values must lie between zero and one, and extensive numerical experience suggest that they may be evaluated according to the assessments in Table 4:1. The value of the M.S.A. scores appears to be a function of four main effects. The M.S.A. improves as the number of variables increase, as the number of factors decrease, as the number of cases increase, and as the general level of correlation increases[40]. Clearly any variable with a high M.S.A. score is likely to be highly suitable for use in factor analysis.

The Research Problem

The objectives of the present study are twofold: to establish which social and economic indicators are associated with underdevelopment, and to establish which are the underdeveloped regions of Spain. In factor analysis terms this involves an exploration of the relationships between numerous variables, of explaining these relationships in terms of a simpler set of relations between the 'underlying dimensions' of the data, and finally, going through an exercise in descriptive typology to place the provinces of Spain into more or less homogeneous regions.

TABLE 4:2

Variables Used to Measure Agricultural Development in Spain.

| | Data Used | Year | Indicator of Development |
|---|---|---|---|
| i) | Inhabitants per 100 ha. of cultivated land | 1967 | pressure of population on the land |
| ii) | Active persons in agriculture per 100 ha. of cultivated land | 1967 | intensity of agricultural production |
| iii) | Per cent active population in agriculture | 1967 | importance of agriculture in the economy |
| iv) | Value of livestock per 100 persons active in agriculture | 1967 | importance of livestock production |
| v) | Value of livestock per 100 ha. of cultivated land and pasture land | 1964 | intensity of livestock production |
| vi) | Number of tractors per 100 persons active in agriculture | 1967 | importance of mechanization |
| vii) | Number of tractors per 100 ha. of cultivated land | 1967 | intensity of mechanization |
| viii) | Consumption of fertilizers per ha. of cultivated land | 1967 | modern farming techniques |
| ix) | Per cent land under small (<5 ha.) farms | 1962 | minifundio farms |
| x) | Per cent land under large (> 200 ha.) farms | 1962 | latifundio farms |
| xi) | Net production in agriculture per active person in agriculture | 1967 | agricultural productivity |
| xii) | Cereal crop yields - not rice (Qm./ha.) | 1967 | cereal crop yields |
| xiii) | Crop yields of maize (Qm./ha.) | 1967 | maize yields |

TABLE 4:2 cont.

| | Data Used | Year | Indicator of Development |
|---|---|---|---|
| xiv) | Production of milk per ha. of cultivated land and pasture land | 1967 | intensity of milk production |
| xv) | Production of meat (kg.) per ha. of cultivated land and pasture land | 1967 | importance of meat production |
| xvi) | Number of fields of less than 1 ha. | 1962 | small sized fields minifundios |
| xvii) | Number of fields per farm | 1962 | relative fragmentation of production |

Note: for the sources of this data see Appendix B.

As the analysis was used here as an exploratory procedure, the widest possible variety of relevant indicators were required. In the end a total of 45 variables were selected. For the purposes of the present study it was found to be necessary to divide these variables into three separate groups and analyse each group separately. This was done for two reasons. First, for the tehnical reason that any factor analysis is more reliable if there are many more cases than variables. However, in the Spain study the data used was for the 47 mainland provinces. Thus the number of variables had to be significantly less than 47. Secondly, the possibility of 'chance correlations' between otherwise widely disparate variables was avoided by grouping the variables according to the basic social and economic elements in society: agriculture, industry and social structure.

The Choice of Variables

The choice of variables is a critical step in any factor analysis procedure. However, there are no simple criteria by which the variables can be chosen. For example should development be measured in terms of economic production, economic structure, employment opportunities, economic wealth, or by living standards, etc.? Also, since the variables have to be chosen from what is available rather than what is desirable, there is a complete reliance on published data sources. Many variables which ought to be included have no data measurements and are therefore precluded from any analysis.

Agriculture is generally the poorest sector of the Spanish economy, the average per capita income being only a half to a third of that in industry or the service sector[41]. Within the agrarian sector there is a great deal of variety from the rich huerta lands of Valencia to the poor minifundio areas of Galicia; nevertheless underdevelopment in Spain is usually strongly associated with the poorer farming areas.

In this study the importance of agriculture in the regional economy was defined in terms of the proportion of active population employed (Table 4:2). The adoption of modern farming techniques gives a useful indication of the

state of development of the farm economy and was measured here by three indices: the consumption of fertilizers per hectare of cultivated land, the number of tractors per 100 persons active in agriculture and the number of tractors per 100 hectares of cultivated land.

Levels of production play a dominant role in determining farm incomes, and so net production per active person was used as an indicator of the overall level of productivity in agriculture. Supplementary indicators of productivity were supplied by the yields per hectare of maize, the value of livestock raised per hectare of cultivated and meadow land, and the yields per hectare of all cereal crops, excepting rice which is not grown in every province.

The land holding structure plays an important role in determining what types of agricultural activity are possible, and strongly influences the profitability of many farm enterprises[42]. In particular the large estates, the latifundios, and the small farms, the minifundios, have attracted the attention of reformers as representing the least efficient forms of land holding system. The latifundios were defined here simply as those farms of over 200 hectares. The minifundios were defined in terms of their fragmentation in numbers of fields per farm; and in terms of their small size as the number of fields of less than one hectare and as the proportion of farms of less than five hectares.

Because of the wide variety of farming enterprise in Spain, some indication of type of farm produce was included. The more advanced forms of agriculture in Spain tend to be those which have moved away from the traditional crops of wheat, olives and vines, and towards those foodstuffs required by the new urban population, especially meat, milk and dairy produce. This aspect was covered by indicators of the intensity of meat and milk production per hectare of cultivated and meadow land. Lastly, some measure of the pressure of population on the land was included. The number of inhabitants per 100 hectares of cultivated land gave some indication of the intensity of land use, with competition forcing farmers to engage in

TABLE 4:3

Variables Used to Measure Industrial Development in Spain.

| | Data Used | Year | Indicator of Development |
|---|---|---|---|
| i) | Per cent active population employed in industry | 1967 | relative importance of industry |
| ii) | National income per capita | 1967 | level of economic activity |
| iii) | Balance held in local savings banks | 1967 | level of financial activity |
| iv) | Commercial licences per 100 persons | 1967 | level of commercial activity |
| v) | Telephones per 100 persons | 1968 | level of communication |
| vi) | Per cent of total net production from industry | 1967 | relative importance of industry |
| vii) | Cost of personnel per hour, textile industry | 1965 | index of labour costs |
| viii) | Average number of workers per factory, textile industry | 1965 | size of economic unit |
| ix) | Cost of personnel per hour, food industry | 1965 | index of labour costs |
| x) | Average number of workers per factory, food industry | 1965 | size of economic unit |
| xi) | Cost of personnel per hour, construction, glass and ceramics industry | 1965 | index of labour costs |
| xii) | Average number of workers per factory, construction, glass and ceramics industry | 1965 | size of economic unit |

Note: for the sources of this data see Appendix B.

more advanced and economic forms of agriculture. As a corollary to this indicator, the number of active persons in agriculture per 100 hectares of cultivated land was used to give some indication of the overall intensity of agricultural production.

Industry generally forms the most prosperous sector of the Spanish economy, although like agriculture it contains a very wide variety of conditions, ranging from small workshops, or artesania, to giant international companies. The relative importance of industry within the economy was measured here by the proportion of active population employed and the proportion of total net production obtained from industry (Table 4:3). Levels of industrial and economic activity were represented by figures for national income per capita, by the level of financial activity in the local savings banks, and by the number of commercial licences per 100 inhabitants. The number of telephones per 100 inhabitants was used as an indicator of the level of 'communication' or 'integration' within the economy.

The level of wages paid per hour in a particular industry gives an indication of the degree of competition that exists for labour. Generally, in more advanced areas higher wages have to be paid in order to attract sufficient labour. High labour costs also influence the capital/labour ratio of an industry, and act as an incentive to management to introduce more advanced and capital intensive methods and equipment. Data was obtained for the labour costs in three industries: textiles, construction and glass, and the food industry. This choice was determined largely by the need to use those industries which are well represented in each of the 47 mainland provinces.

Lastly, because of the wide range in the scale of industrial activity in Spain, three indicators of the size of economic units were used. Size was measured in terms of the average number of workers per factory, and the data was obtained for the same three industries as used above, and for the same reason.

TABLE 4:4

Variables Used to Measure Social Development in Spain.

| | Data Used | Year | Indicator of Development |
|---|---|---|---|
| i) | Population change | 1961-1970 | overall demographic change |
| ii) | Net migration | 1961-1970 | overall demographic change |
| iii) | Net migration of 15-24 year age group | 1964-1970 | selective demographic change |
| iv) | Net migration of professionally qualified | 1964-1970 | selective demographic change |
| v) | Students who matriculate at 'Bachillerato General' per 100,000 population | 1966 | basic education |
| vi) | Students who matriculate at 'Bachillerato Superior' per 100 of 15-17 age group | 1967 | higher education |
| vii) | Per cent unemployed | 1967 | unemployed |
| viii) | Index of average consumption per household | 1968 | household consumption |
| ix) | Investment by local authorities per inhabitant | 1965 | investment in infra-structure and social services |
| x) | Per capita family income | 1967 | family income |
| xi) | Per cent of houses with two or more persons per room | 1968 | availability of housing and overcrowding |
| xii) | Per cent of houses without running water | 1968 | quality of housing |
| xiii) | Per cent of households where head of household is illiterate | 1968 | illiteracy |
| xiv) | Increase in number of professional workers per 1,000 persons active | 1950-1960 | employment structure |

TABLE 4:4 cont.

| | Data Used | Year | Indicator of Development |
|---|---|---|---|
| xv) | Increase in number of salaried workers per 1,000 persons active | 1950-1960 | employment structure |
| xvi) | Cost of living | 1958-1968 | cost of living |

Note: for the sources of this data see Appendix B.

Social factors are both an outcome and a cause of underdevelopment. For example poor housing, low incomes, etc., are the result of an underdeveloped economy, whilst selective migration, low levels of education, etc., are a cause of regional backwardness. Demographic factors are probably the most powerful of the internal forces shaping the social and economic structure of modern Spain[43]. Overall demographic change was measured here by net population change and net migration figures. Selective demographic change was measured by the figures for net migration of the young and the professionally qualified (Table 4:4). Levels of education were defined in terms of the number of students who qualified at the Bachillerato General (basic education), and at the Bachillerato Superior (advanced education).

Employment and employment structure were covered by measures of the levels of unemployment and the changing levels of employment amongst professional and salaried workers. However, it should be remembered that in Spain where the state 'guarantees' everyone work, and where there is less freedom for labour over choice of type and place of employment, the concept of unemployment takes on a different meaning from that in other parts of Western Europe[44].

Family wealth was measured by the average level of family income, the average level of household expenditure and by changes in the cost of living. Closely linked to family wealth were two indicators measuring the availability and quality of housing. The social development of the family was covered by the rate of illiteracy amongst heads of households. Illiteracy still forms a significant problem in the less developed parts of Spain, and obviously plays a crucial role in the social and economic advancement of the individual.

Lastly, an indicator was included which measured the investment in infrastructure and social services of each province by the level of spending per inhabitant of the local authorities.

Clearly the criteria selected here do not represent the only variables

TABLE 4:5

MEANS AND STANDARD DEVIATIONS

| | MEAN | SD |
|---|---|---|
| 1 | 0.3832E 03 | 0.6479E 03 |
| 2 | 0.3883E 02 | 0.5087E 02 |
| 3 | 0.4094E 02 | 0.1598E 02 |
| 4 | 0.2447E 02 | 0.1255E 02 |
| 5 | 0.3088E 04 | 0.2825E 04 |
| 6 | 0.6972E 01 | 0.5136E 01 |
| 7 | 0.1470E 01 | 0.1045E 01 |
| 8 | 0.6032E 02 | 0.4481E 02 |
| 9 | 0.7830E 01 | 0.6678E 01 |
| 10 | 0.4660E 02 | 0.1230E 02 |
| 11 | 0.6634E 05 | 0.2077E 05 |
| 12 | 0.1534E 02 | 0.4863E 01 |
| 13 | 0.2757E 02 | 0.1007E 02 |
| 14 | 0.1240E 03 | 0.2154E 03 |
| 15 | 0.2952E 02 | 0.4087E 02 |
| 16 | 0.7313E 03 | 0.8009E 03 |
| 17 | 0.1462E 02 | 0.1335E 02 |

| | | | | |
|---|---|---|---|---|
| 1 | 1,0000 | 0,6421 | -0,5918 | 0,2507 |
| 2 | 0,6421 | 1,0000 | -0,1022 | 0,2835 |
| 3 | -0,5918 | -0,1022 | 1,0000 | -0,0373 |
| 4 | 0,2507 | 0,2835 | -0,0373 | 1,0000 |
| 5 | 0,6834 | 0,8792 | -0,1818 | 0,5051 |
| 6 | -0,2117 | -0,4598 | -0,3351 | -0,0214 |
| 7 | 0,4773 | 0,2391 | -0,6556 | 0,1243 |
| 8 | 0,6377 | 0,6037 | -0,5227 | 0,0402 |
| 9 | 0,4232 | 0,7821 | -0,0478 | -0,1315 |
| 10 | -0,3671 | -0,1364 | 0,2281 | -0,0012 |
| 11 | 0,2092 | -0,2450 | -0,5856 | 0,1626 |
| 12 | 0,4981 | 0,3908 | -0,4240 | 0,2998 |
| 13 | -0,1790 | -0,2098 | 0,0945 | -0,0476 |
| 14 | 0,8923 | 0,6847 | -0,4396 | 0,4082 |
| 15 | 0,8808 | 0,4104 | -0,6565 | 0,1270 |
| 16 | -0,1145 | 0,2959 | 0,4808 | 0,2814 |
| 17 | -0,2450 | -0,0740 | 0,3954 | 0,4358 |

| | | | | |
|---|---|---|---|---|
| 1 | 0,2092 | 0,4981 | -0,1790 | 0,8923 |
| 2 | -0,2450 | 0,3908 | -0,2098 | 0,6847 |
| 3 | -0,5856 | -0,4240 | 0,0945 | -0,4396 |
| 4 | 0,1626 | 0,2998 | -0,0476 | 0,4082 |
| 5 | -0,1158 | 0,5011 | -0,2191 | 0,7442 |
| 6 | 0,6540 | 0,1051 | 0,0400 | -0,2689 |
| 7 | 0,5270 | 0,4822 | -0,1455 | 0,3290 |
| 8 | 0,2828 | 0,5810 | 0,0207 | 0,5428 |
| 9 | -0,2115 | 0,2799 | -0,1239 | 0,4427 |
| 10 | -0,2312 | -0,1931 | -0,0498 | -0,2655 |
| 11 | 1,0000 | 0,4636 | 0,1244 | 0,1452 |
| 12 | 0,4636 | 1,0000 | 0,2466 | 0,5433 |
| 13 | 0,1244 | 0,2466 | 1,0000 | -0,1412 |
| 14 | 0,1452 | 0,5433 | -0,1412 | 1,0000 |
| 15 | 0,3836 | 0,4676 | -0,1373 | 0,7485 |
| 16 | -0,2992 | -0,0763 | 0,0979 | -0,0543 |
| 17 | 0,0236 | -0,0982 | 0,1111 | -0,1539 |

CORRELATION MATRIX

| | | | | | |
|---|---|---|---|---|---|
| 0,6834 | -0,2117 | 0,4773 | 0,6377 | 0,4232 | -0,3671 |
| 0,8792 | -0,4598 | 0,2391 | 0,6037 | 0,7821 | -0,1364 |
| -0,1818 | -0,3351 | -0,6556 | -0,5227 | -0,0478 | 0,2281 |
| 0,5051 | -0,0214 | 0,1243 | 0,0402 | -0,1315 | -0,0012 |
| 1,0000 | -0,3786 | 0,3689 | 0,4853 | 0,6636 | -0,3088 |
| -0,3786 | 1,0000 | 0,4570 | -0,0291 | -0,3800 | -0,0553 |
| 0,3689 | 0,4570 | 1,0000 | 0,5809 | 0,2531 | -0,4432 |
| 0,4853 | -0,0291 | 0,5809 | 1,0000 | 0,4773 | -0,3076 |
| 0.6636 | -0,3800 | 0,2531 | 0,4773 | 1,0000 | -0,2690 |
| -0,3088 | -0,0553 | -0,4432 | -0,3076 | -0,2690 | 1,0000 |
| -0,1158 | 0,6540 | 0,5270 | 0,2828 | -0,2115 | -0,2312 |
| 0,5011 | 0,1051 | 0,4822 | 0,5810 | 0,2799 | -0,1931 |
| -0,2191 | 0,0400 | -0,1455 | 0,0207 | -0,1239 | -0,0498 |
| 0,7442 | -0,2689 | 0,3290 | 0,5428 | 0,4427 | -0,2655 |
| 0,5407 | -0,0314 | 0,5226 | 0,4846 | 0,3968 | -0,4219 |
| 0,3338 | -0,3235 | -0,2386 | -0,1335 | 0,3595 | -0,0462 |
| 0.0245 | -0,0822 | -0,3248 | -0,2781 | -0,1121 | 0,0260 |

| | | |
|---|---|---|
| 0,8808 | -0,1145 | -0,2450 |
| 0,4104 | 0,2959 | -0,0740 |
| -0,6565 | 0,4808 | 0,3954 |
| 0,1270 | 0,2814 | 0,4358 |
| 0,5407 | 0,3338 | 0,0245 |
| -0,0314 | -0,3235 | -0,0822 |
| 0,5226 | -0,2386 | -0,3248 |
| 0,4846 | -0,1335 | -0,2781 |
| 0,3968 | 0,3595 | -0,1121 |
| -0,4219 | -0,0462 | 0,0260 |
| 0,3836 | -0,2992 | 0,0236 |
| 0,4676 | -0,0763 | -0,0982 |
| -0,1373 | 0,0979 | 0,1111 |
| 0,7485 | -0,0343 | -0,1539 |
| 1,0000 | -0,1095 | -0,2130 |
| -0,1095 | 1,0000 | 0,7655 |
| -0,2130 | 0,7655 | 1,0000 |

---

TABLE 4:7

SQUARED MULTIPLE CORRELATION COEFFICIENT (SMC) OF EACH VARIABLE WITH THE REMAINING P-1

| | SMC |
|---|---|
| 1 | 0,9639 |
| 2 | 0.9618 |
| 3 | 0,7463 |
| 4 | 0,8382 |
| 5 | 0,9550 |
| 6 | 0.7435 |
| 7 | 0.8314 |
| 8 | 0,7987 |
| 9 | 0,9102 |
| 10 | 0,5622 |
| 11 | 0.8216 |
| 12 | 0,7403 |
| 13 | 0,4648 |
| 14 | 0.8948 |
| 15 | 0,9276 |
| 16 | 0.8815 |
| 17 | 0.8621 |

TABLE 4:8

MEASURE OF SAMPLING ADEQUACY (MSA) OF EACH VARIABLE

| | MSA |
|---|---|
| 1 | 0,6766 |
| 2 | 0,6127 |
| 3 | 0,8968 |
| 4 | 0,4821 |
| 5 | 0,6753 |
| 6 | 0,6327 |
| 7 | 0,6901 |
| 8 | 0,7916 |
| 9 | 0,5704 |
| 10 | 0,4789 |
| 11 | 0,7060 |
| 12 | 0,6959 |
| 13 | 0,2950 |
| 14 | 0,8152 |
| 15 | 0,7017 |
| 16 | 0,5711 |
| 17 | 0,5291 |

OVERALL MEASURE OF SAMPLING ADEQUACY = 0,6653

TABLE 4:9

FACTOR PATTERN MATRIX (COLUMN STANDARDIZED)

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0.3253 | 2.9096 | -0.3670 | -0.2725 | -0.2639 |
| 2 | 2.7873 | -0.1169 | -0.3173 | -0.2959 | 0.4880 |
| 3 | 0.2128 | -0.5820 | 0.5184 | -0.9854 | 0.0227 |
| 4 | 0.8365 | -0.1375 | 0.5989 | 0.4012 | -2.5558 |
| 5 | 2.2895 | 0.2693 | 0.5350 | 0.3796 | -0.6549 |
| 6 | -0.3126 | -0.4560 | -0.0875 | 1.7434 | -0.1785 |
| 7 | 0.3399 | -0.1726 | -0.3230 | 2.2277 | 0.2979 |
| 8 | 0.6310 | -0.0019 | -0.5210 | 1.0640 | 0.4721 |
| 9 | 0.9868 | -0.0259 | 0.5845 | 0.3258 | 2.6421 |
| 10 | 0.1690 | -0.3576 | -0.4289 | -0.5314 | -0.4999 |
| 11 | -0.5770 | 0.2816 | 0.3855 | 2.0539 | -0.3217 |
| 12 | 0.4831 | -0.0419 | -0.0607 | 1.1972 | -0.3439 |
| 13 | -0.1728 | -0.0574 | 0.2651 | 0.2165 | 0.0913 |
| 14 | 0.5992 | 1.3435 | -0.2108 | -0.3389 | -0.7803 |
| 15 | -0.6558 | 2.4143 | 0.5930 | 0.4400 | 0.7367 |
| 16 | 0.2356 | -0.1290 | 2.7339 | -0.1601 | 0.6035 |
| 17 | -0.2892 | 0.0583 | 2.6171 | 0.0805 | -0.6408 |

TABLE 4:10

FACTOR PATTERN MATRIX (CONVENTIONALLY

| | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 0.11 | 0.91* | -0.06 |
| 2 | 0.98* | -0.04 | -0.06 |
| 3 | 0.19 | -0.48 | 0.24 |
| 4 | 0.61 | -0.09 | 0.22 |
| 5 | 0.88* | 0.09 | 0.10 |
| 6 | -0.29 | -0.38 | -0.04 |
| 7 | 0.25 | -0.12 | -0.12 |
| 8 | 0.51 | -0.00 | -0.21 |
| 9 | 0.53 | -0.01 | 0.16 |
| 10 | 0.20 | -0.37 | -0.26 |
| 11 | -0.44 | 0.20 | 0.15 |
| 12 | 0.44 | -0.04 | -0.03 |
| 13 | -0.23 | -0.07 | 0.18 |
| 14 | 0.35 | 0.72* | -0.06 |
| 15 | -0.32 | 1.07* | 0.14 |
| 16 | 0.15 | -0.07 | 0.85* |
| 17 | -0.19 | 0.04 | 0.88* |

SCALED), SALIENTS MARKED WITH ASTERISK

| 4 | 5 |
|---|---|
| -0,05 | -0.04 |
| -0,05 | 0.07 |
| -0,44 | 0.01 |
| 0,14 | -0.77* |
| 0,07 | -0.10 |
| 0,79* | -0.07 |
| 0,82* | 0.09 |
| 0,43* | 0.16 |
| 0,09 | 0.59* |
| -0,31 | -0.25 |
| 0,78* | -0.10 |
| 0,55* | -0.13 |
| 0,14 | 0.05 |
| -0,10 | -0.19 |
| 0,11 | 0.15 |
| -0,05 | 0.15 |
| 0,03 | -0.18 |

TABLE 4:11

INDEX OF FACTORIAL SIMPLICITY FOR EACH VARIABLE

| | IFS |
|---|---|
| 1 | 0,9457 |
| 2 | 0,9333 |
| 3 | 0,5350 |
| 4 | 0,8042 |
| 5 | 0,8128 |
| 6 | 0,8740 |
| 7 | 0,9203 |
| 8 | 0,4763 |
| 9 | 0,7948 |
| 10 | 0,2679 |
| 11 | 0,8312 |
| 12 | 0,7601 |
| 13 | 0,3908 |
| 14 | 0,5463 |
| 15 | 0,7427 |
| 16 | 0,9281 |
| 17 | 0,9157 |

OVERALL INDEX OF FACTORIAL SIMPLICITY = 0,86

that could have been chosen, nor would these variables necessarily have been chosen by other researchers. Nevertheless within the limitations imposed by the availability of data the variables chosen here would appear to give a reasonable basis for anlysing the underdeveloped regions of Spain.

Factor Analysis of Agricultural Underdevelopment in Spain

Data for the 17 variables listed in Table 4:2 were analysed. The means and standard deviations of the data are shown in Table 4:5, and the correlation matrix of each variable with every other variable is shown in Table 4:6. It is from this matrix, together with the estimates of the communalities which are the squared multiple correlation co-efficients of each variable with all the remaining variables (Table 4:7), that the factors are obtained.

The overall measure of sampling adequacy (M.S.A.) of the data is 0.6653, which is quite acceptable (Table 4:8). Most of the variables were above the 0.50 level of acceptability, with the most adequate levels occurring in the variables for the percentage of the active population engaged in agriculture and the production of milk per hectare of cultivated and pasture land. Less acceptable levels were reached by the variables for crop yields in maize, the percentage of land under large farms and the value in livestock per 100 persons in agriculture. Fortunately these latter variables do not play an important role in the analysis.

The factor pattern matrix column standardized gives factor loadings for each variable (Table 4:9). The variables with high loadings on this original factor pattern matrix are indicated by an asterisk on the second factor pattern matrix, this time conventially scaled (Table 4:10). It is from this latter matrix that the factors are identified[45]. The analysis extracted five factors from the data. These five factors display an overall index of factorial simplicity (I.F.S.) of 0.86, which is highly satisfactory. Most of the individual variables display a very high level of factorial simplicity except for the variables for latifundios and crop yields of maize (Table 4:11). However, these last two variables play no

TABLE 4:12

FACTOR INTERCORRELATION MATRIX

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 1.0000 | 0.6606 | 0.2121 | 0.1493 | 0.3154 |
| 2 | 0.6606 | 1.0000 | -0.1575 | 0.5213 | 0.1343 |
| 3 | 0.2121 | -0.1575 | 1.0000 | -0.2651 | -0.1132 |
| 4 | 0.1493 | 0.5213 | -0.2651 | 1.0000 | -0.0588 |
| 5 | 0.3154 | 0.1343 | -0.1132 | -0.0588 | 1.0000 |

part in the interpretation of the factors. These results conform to the general principle that nature is simple, and that any natural influence or factor will affect only a few variables and not all indiscriminately[46].

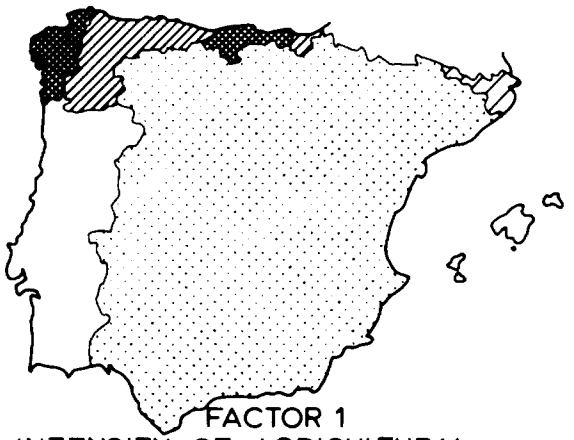
The five factors with their associated variables are shown in Table 4:13. Because the factors were obtained by oblique transformations they are inter-correlated (Table 4:12). The most significant features of these relationships are the high negative correlations of factor 1 (intensity of agricultural production) with factor 2 (urban farming patterns) and factor 2 with factor 4 (the level of modern and productive farming methods). These factor relationships indicate that in areas of highly intensive production or of modern farming methods, agriculture is orientated directly towards meeting the needs of the urban market.

Factor 1, which accounts for nearly 40% of the variance explained, is associated with levels of agricultural production, especially livestock production. Also associated with this factor is the value of livestock per 100 persons active in agriculture, the presence of small farms, and the frequent use of fertilizers. This factor has picked out the small, intensively cultivated farms with a high consumption of fertilizers and a strong reliance on the livestock sector. At the opposite extreme low scores on this factor indicate the medium and large farms which are extensively rather than intensively cultivated, and where crops such as cereals, olives and the vine are of more importance than livestock.

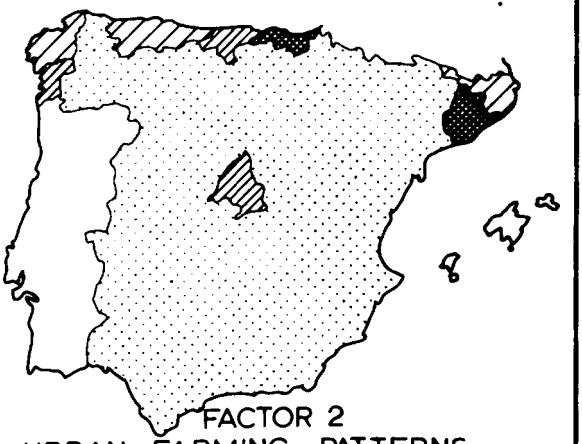
This factor has clearly separated out the farming systems of pluviose and arid Spain[47]. Figure 4:1 shows that the provinces of arid Spain score within -1 standard deviation of the factor scores mean, indicating that low intensity agricultural production is common in this part of Spain. What is surprising is that there are no provinces with very low scores on this factor, which is to say that there are no provinces with outstandingly low levels of agricultural productivity. The areas of intensive farming stand out in sharp contrast to the rest of the country. In the pluviose zone most provinces are more than 1 standard deviation from the factor scores mean,

FIGURE 4:1

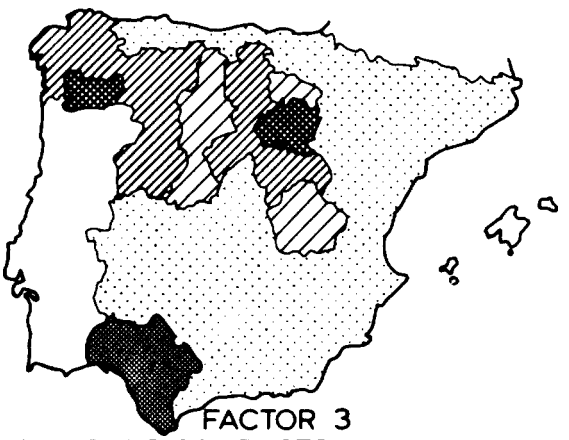
# AGRICULTURAL DEVELOPMENT IN SPAIN: FACTOR SCORES



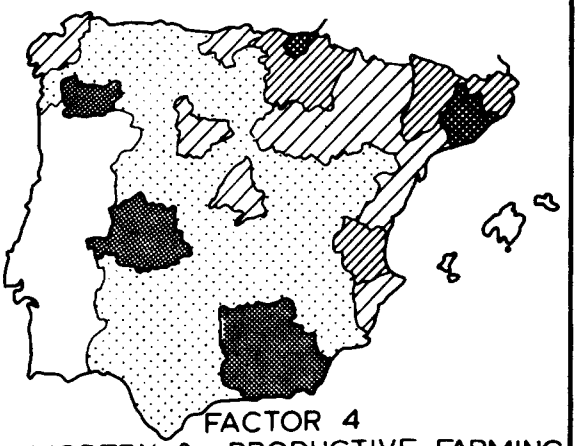
FACTOR 1
INTENSITY OF AGRICULTURAL PRODUCTION



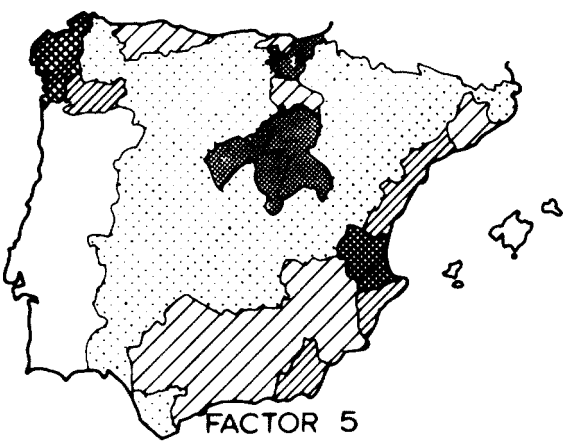
FACTOR 2
URBAN FARMING PATTERNS



FACTOR 3
MINIFUNDIOS FACTOR



FACTOR 4
MODERN & PRODUCTIVE FARMING METHODS



FACTOR 5
SMALL NON-LIVESTOCK FARMS

STANDARD DEVIATIONS FROM FACTOR SCORES MEAN

| | | |
|---|---|---|
| + | >2·0 | |
| | 1·0—2·0 | |
| | 0—1·0 | |
| — | 0—1·0 | |
| | 1·0—2·0 | |
| | <2·0 | |

TABLE 4:13

The Agricultural Factors.

| Relationship | | Variable No. | Description | Factor 1 |
|---|---|---|---|---|
| i) | 0.98 | 2 | intensity of agricultural production | |
| ii) | 0.88 | 5 | intensity of livestock production | Intensity of agricultural production |
| iii) | 0.61 | 4 | importance of livestock in the economy | |
| iv) | 0.53 | 9 | minifundio farms | 39.9% |
| v) | 0.51 | 8 | modern farming techniques | |

| Relationship | | Variable No. | Description | Factor 2 |
|---|---|---|---|---|
| i) | 1.07 | 15 | importance of meat production | |
| ii) | 0.91 | 1 | population pressure on the land | Urban farming patterns |
| iii) | 0.72 | 14 | intensity of milk production | |
| iv) | -0.48 | 3 | importance of agriculture in the economy | 33.4% |

| Relationship | | Variable No. | Description | Factor 3 |
|---|---|---|---|---|
| i) | 0.88 | 17 | relative fragmentation | Minifundios factor |
| ii) | 0.85 | 16 | small sized fields | 10.0% |

| Relationship | | Variable No. | Description | Factor 4 |
|---|---|---|---|---|
| i) | 0.82 | 7 | intensity of mechanization | |
| ii) | 0.79 | 6 | importance of mechanization | Modern and productive farming methods |
| iii) | 0.73 | 11 | agricultural productivity | |
| iv) | 0.55 | 12 | level of cereal crop yields | 9.8% |
| v) | 0.43 | 8 | modern farming techniques | |

TABLE 4:13 cont.

| Relationship | Variable No. | Description | Factor 5 |
|---|---|---|---|
| i) -0.77 | 4 | importance of livestock | Small non-livestock farms 6.8% |
| ii) 0.59 | 9 | minifundio farms | |

Note: the Relationship is that recorded in the factor pattern matrix conventionally scaled (Table 4:10). The Variable No. refers to the listing of the variables in (Table 4:2). The percentages refer to the proportion of explained variance accounted for by each factor. The variables below the pecked line are those which were not prominent on the factor pattern matrix column standardized, but nevertheless are associated with the factor as shown on the factor pattern matrix conventionally scaled. Note also that all the factors have been made positive.

and 4 are more than 2 standard deviations away. In this area dairy farming is of prime importance, especially in Corunna and Santander, which accounts for the very high factor scores of those two provinces.

Factor 2, which accounts for 33% of the variance explained, is associated with a pattern of farming orientated towards the requirements of urban society. This factor has picked out the areas of high population densities where there is a relatively small farming sector intensively engaged in meat and milk production, presumably to supply the local urban population (Table 4:13). This conclusion is borne out by the pattern of factor scores shown in Figure 4:1. Those provinces with the highest factor scores contain the main urban centres of Spain, notably Vizcaya, Barcelona, Guipúzcoa and Madrid. The rest of the country, with factor scores less than 1 standard deviation below the mean, would appear to be uniformly less affected by the need to supply the major cities. This suggests that the regional impact of a large metropolitan centre on Spanish agriculture is confined to within a single province.

The third factor, which accounts for 10% of the variance explained, has separated out the minifundios area of Spain. The variables associated with this factor are the number of fields per farm and the number of fields of less than one hectare. However, it is important to note that variable nine, farms of less than five hectares, is not included in this factor. This suggests that minifundismo in Spain is connected with fragmentation of holding and small field size, but not with small farm size. Figure 4:1 shows that north-west Spain is strongly influenced by this factor, most provinces being more than 1 standard deviation from the factor scores mean, with Orense and Soria more than 2. This is the classic area of minifundios in Spain, although it is a little surprising that the provinces along the Cantabrian coast are not included. Eastern and southern Spain are not important areas of minifundismo, and in the provinces of Huelva, Seville and Cádiz where the latifundios predominate, the minifundios are notably absent.

The fourth factor, which accounts for nearly 10% of the variance explained, is associated with modern and productive farming methods. This

TABLE 4:14

MEANS AND STANDARD DEVIATIONS

| | MEAN | SD |
|---|---|---|
| 1 | 0.2941E 02 | 0.1085E 02 |
| 2 | 0.3885E 02 | 0.1168E 02 |
| 3 | 0.9106E 01 | 0.6511E 01 |
| 4 | 0.1857E 01 | 0.4307E 00 |
| 5 | 0.7791E 01 | 0.4125E 01 |
| 6 | 0.3169E 02 | 0.9274E 01 |
| 7 | 0.2799E 02 | 0.3075E 01 |
| 8 | 0.3352E 02 | 0.2576E 02 |
| 9 | 0.2492E 02 | 0.5675E 01 |
| 10 | 0.2296E 02 | 0.1547E 02 |
| 11 | 0.2364E 02 | 0.4855E 01 |
| 12 | 0.1343E 02 | 0.1045E 02 |

TABL

| | | | | |
|---|---|---|---|---|
| 1 | 1.0000 | 0.8207 | 0.6819 | 0.5433 |
| 2 | 0.8207 | 1.0000 | 0.7076 | 0.6886 |
| 3 | 0.6819 | 0.7076 | 1.0000 | 0.5382 |
| 4 | 0.5433 | 0.6886 | 0.5382 | 1.0000 |
| 5 | 0.7585 | 0.8207 | 0.4919 | 0.5406 |
| 6 | 0.9033 | 0.6843 | 0.5864 | 0.4218 |
| 7 | 0.0373 | 0.0768 | 0.1764 | -0.1004 |
| 8 | 0.3856 | 0.3375 | 0.2503 | 0.3281 |
| 9 | 0.1493 | 0.2789 | 0.1655 | 0.1134 |
| 10 | 0.1965 | 0.1473 | 0.0021 | -0.0497 |
| 11 | 0.5185 | 0.4324 | 0.2937 | 0.1518 |
| 12 | 0.3759 | 0.2968 | 0.1710 | 0.0335 |

| | | |
|---|---|---|
| 1 | 0.5185 | 0.3759 |
| 2 | 0.4324 | 0.2968 |
| 3 | 0.2937 | 0.1710 |
| 4 | 0.1518 | 0.0335 |
| 5 | 0.4083 | 0.2685 |
| 6 | 0.5530 | 0.4745 |
| 7 | -0.0468 | -0.0122 |
| 8 | 0.0328 | 0.1530 |
| 9 | 0.2214 | 0.0331 |
| 10 | -0.0650 | -0.0697 |
| 11 | 1.0000 | 0.6679 |
| 12 | 0.6679 | 1.0000 |

CORRELATION MATRIX

E 4:15

| | | | | | |
|---|---|---|---|---|---|
| 0,7585 | 0,9033 | 0,0373 | 0,3856 | 0,1493 | 0,1965 |
| 0,8207 | 0,6843 | 0,0768 | 0,3375 | 0,2789 | 0,1473 |
| 0,4919 | 0,5864 | 0,1764 | 0,2503 | 0,1655 | -0,0021 |
| 0,5406 | 0,4218 | -0,1004 | 0,3281 | 0,1134 | -0,0497 |
| 1,0000 | 0,5551 | 0,0765 | 0,3582 | 0,1172 | 0,1037 |
| 0,5551 | 1,0000 | 0,0605 | 0,2475 | 0,1445 | 0,1676 |
| 0,0765 | 0,0605 | 1,0000 | -0,1364 | 0,0256 | -0,0837 |
| 0,3582 | 0,2475 | -0,1364 | 1,0000 | -0,0205 | 0,1865 |
| 0,1172 | 0,1445 | 0,0256 | -0,0205 | 1,0000 | 0,0993 |
| 0,1037 | 0,1676 | -0,0837 | 0,1865 | 0,0993 | 1,0000 |
| 0,4083 | 0,5530 | -0,0468 | 0,0328 | 0,2214 | -0,0650 |
| 0,2685 | 0,4745 | -0,0122 | 0,1530 | 0,0331 | -0,0697 |

TABLE 4:16

SQUARED MULTIPLE CORRELATION COEFFICIENT (SMC) OF EACH VARIABLE WITH THE REMAINING P-1

| | SMC |
|---|---|
| 1 | 0,9374 |
| 2 | 0,8713 |
| 3 | 0,6367 |
| 4 | 0,5972 |
| 5 | 0,7970 |
| 6 | 0,8872 |
| 7 | 0,1728 |
| 8 | 0,3150 |
| 9 | 0,1948 |
| 10 | 0,2366 |
| 11 | 0,6079 |
| 12 | 0,5542 |

TABLE 4:17

MEASURE OF SAMPLING ADEQUACY (MSA) OF EACH VARIABLE

| | MSA |
|---|---|
| 1 | 0,7346 |
| 2 | 0,7959 |
| 3 | 0,8007 |
| 4 | 0,7896 |
| 5 | 0,7228 |
| 6 | 0,7202 |
| 7 | 0,2786 |
| 8 | 0,6897 |
| 9 | 0,5080 |
| 10 | 0,3615 |
| 11 | 0,7568 |
| 12 | 0,6265 |

OVERALL MEASURE OF SAMPLING ADEQUACY = 0,7291

factor has isolated the areas where high levels of mechanization and modern techniques yield the highest levels of agricultural productivity and high crop returns. Figure 4:1 shows that it is the provinces that contain the main urban centres, especially Barcelona and Guipúzcoa, that have the most modern farming systems. Furthermore there appears to be a considerable spread of these modern methods into the surrounding provinces. When these results are compared with those for factor 2 above, it suggests that the impact of large urban centres on agriculture is more pronounced in the farming methods used than in the type of crops produced. The higher productivity of these areas could be due to a more efficient use of economic resources or through gaining special economic advantages in the urban-industrial regions. The least mechanized provinces include the minifundio province of Orense as well as the markedly latifundio provinces of Cáceres, Jaén, Granada and Almería.

The last factor, which accounts for only 6.8% of the variance explained, is associated with small farms not reliant on the production of livestock. In many respects this factor is complementary to factor 1. Figure 4:1 shows that this factor is important in Galicia and in the Levante. In Galicia there are many small farms engaged in livestock (see Figure 4:1 above) as well as non-livestock activities, whereas in the Levante there are only the small non-livestock farms associated with the rice and fruit growing huertas of the coastal plain. In the rest of the country the small non-livestock farms are not of any great significance.

Factor Analysis of Industrial Underdevelopment in Spain

Data for the 12 variables listed in Table 4:3 were analysed. The means and standard deviations are given in Table 4:14, and the correlation matrix and the squared multiple correlation coefficients shown in Tables 4:15 and 4:16. The overall M.S.A. of the data is 0.7291 which is quite acceptable. Most of the variables were above the 0.50 level of acceptability except for variable 10, the average number of workers per factory in the food industry and variable 7, the cost of personnel per hour in the textile industry.

TABLE 4:18

FACTOR PATTERN MATRIX (COLUMN STANDARDIZED)

| | | | | |
|---|---|---|---|---|
| 1 | 2.4714 | 0.1422 | 0.7141 | -0.2645 |
| 2 | 0.0991 | 2.0177 | 1.2091 | 0.1973 |
| 3 | 0.3045 | 1.8770 | -0.9180 | -0.2834 |
| 4 | -0.1171 | 1.4729 | 0.2505 | -0.5840 |
| 5 | -0.0101 | 0.1436 | 2.5593 | 0.2382 |
| 6 | 2.3031 | -0.0132 | -0.9838 | 0.4545 |
| 7 | -0.0622 | 0.5841 | -0.4876 | 0.0415 |
| 8 | 0.3116 | -0.5668 | 0.9752 | -0.5871 |
| 9 | -0.2160 | 0.7441 | -0.2480 | 0.3853 |
| 10 | 0.5586 | -0.9291 | 0.5390 | -0.7872 |
| 11 | 0.0419 | 0.1339 | 0.1465 | 2.3152 |
| 12 | 0.1007 | -0.3133 | 0.2057 | 2.1753 |

TABLE 4:19

FACTOR PATTERN MATRIX (CONVENTIONALLY SCALED), SALIENTS MARKED WITH ASTERISK

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | 0,85* | 0,03 | 0,12 | -0,03 |
| 2 | 0,05 | 0,58* | 0,30* | 0,03 |
| 3 | 0,25 | 0,90* | -0,38 | -0,08 |
| 4 | -0,10 | 0,75* | 0,11 | -0,17 |
| 5 | -0,01 | 0,05 | 0,80* | 0,05 |
| 6 | 1,06* | -0,00 | -0,23 | 0,07 |
| 7 | -0,08 | 0,42 | -0,31 | 0,02 |
| 8 | 0,35 | -0,37 | 0,56 | -0,22 |
| 9 | -0,27 | 0,53 | -0,15 | 0,16 |
| 10 | 0,67 | -0,65 | 0,33 | -0,31 |
| 11 | 0,04 | 0,07 | 0,06 | 0,65* |
| 12 | 0,09 | -0,17 | 0,09 | 0,65* |

TABLE 4:20

INDEX OF FACTORIAL SIMPLICITY FOR EACH VARIABLE

| | IFS |
|---|---|
| 1 | 0,8831 |
| 2 | 0,6837 |
| 3 | 0,7190 |
| 4 | 0,7927 |
| 5 | 0,9844 |
| 6 | 0,7691 |
| 7 | 0,5845 |
| 8 | 0,4268 |
| 9 | 0,5883 |
| 10 | 0,2619 |
| 11 | 0,9898 |
| 12 | 0,9590 |

OVERALL INDEX OF FACTORIAL SIMPLICITY = 0,86

TABLE 4:21

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | 1.0000 | 0.8620 | 0.8167 | 0.6215 |
| 2 | 0.8620 | 1.0000 | 0.9125 | 0.4151 |
| 3 | 0.8167 | 0.9125 | 1.0000 | 0.4105 |
| 4 | 0.6215 | 0.4151 | 0.4105 | 1.0000 |

FACTOR INTERCORRELATION MATRIX

TABLE 4:22

The Industrial Factors.

| Relationship | | Variable No. | Description | Factor 1 |
|---|---|---|---|---|
| i) | 1.06 | 6 | relative importance of industrial production | Relative importance of industry |
| ii) | 0.85 | 1 | relative importance of industrial employment | 58.7% |
| iii) | 0.67 | 10 | size of economic unit (food industry) | |

| Relationship | | Variable No. | Description | Factor 2 |
|---|---|---|---|---|
| i) | 0.90 | 3 | level of financial activity | |
| ii) | 0.75 | 4 | level of commercial activity | Levels of economic activity |
| iii) | 0.58 | 2 | level of economic activity | 19.9% |
| iv) | -0.65 | 10 | size of economic unit (food industry) | |
| v) | 0.53 | 9 | index of labour costs (food industry) | |

| Relationship | | Variable No. | Description | Factor 3 |
|---|---|---|---|---|
| i) | 0.80 | 5 | level of communication | |
| ii) | 0.30 | 2 | level of economic activity | Communications and economic activity |
| iii) | 0.56 | 8 | size of economic unit (textile industry) | 14.9% |
| iv) | -0.38 | 3 | level of financial activity | |
| v) | 0.33 | 10 | size of economic unit (food industry) | |
| vi) | -0.31 | 7 | index of labour costs (textile industry) | |

| Relationship | | Variable No. | Description | Factor 4 |
|---|---|---|---|---|
| i) | 0.65 | 11 | index of labour costs (construction industry) | Productivity |
| ii) | 0.65 | 12 | size of economic unit (construction industry) | 6.3% |
| iii) | -0.31 | 10 | size of economic unit (food industry) | |

Note: the conventions and sources used in this table are the same as those used in Table 4:13.

These low levels should be seen in the context of the results discussed below.

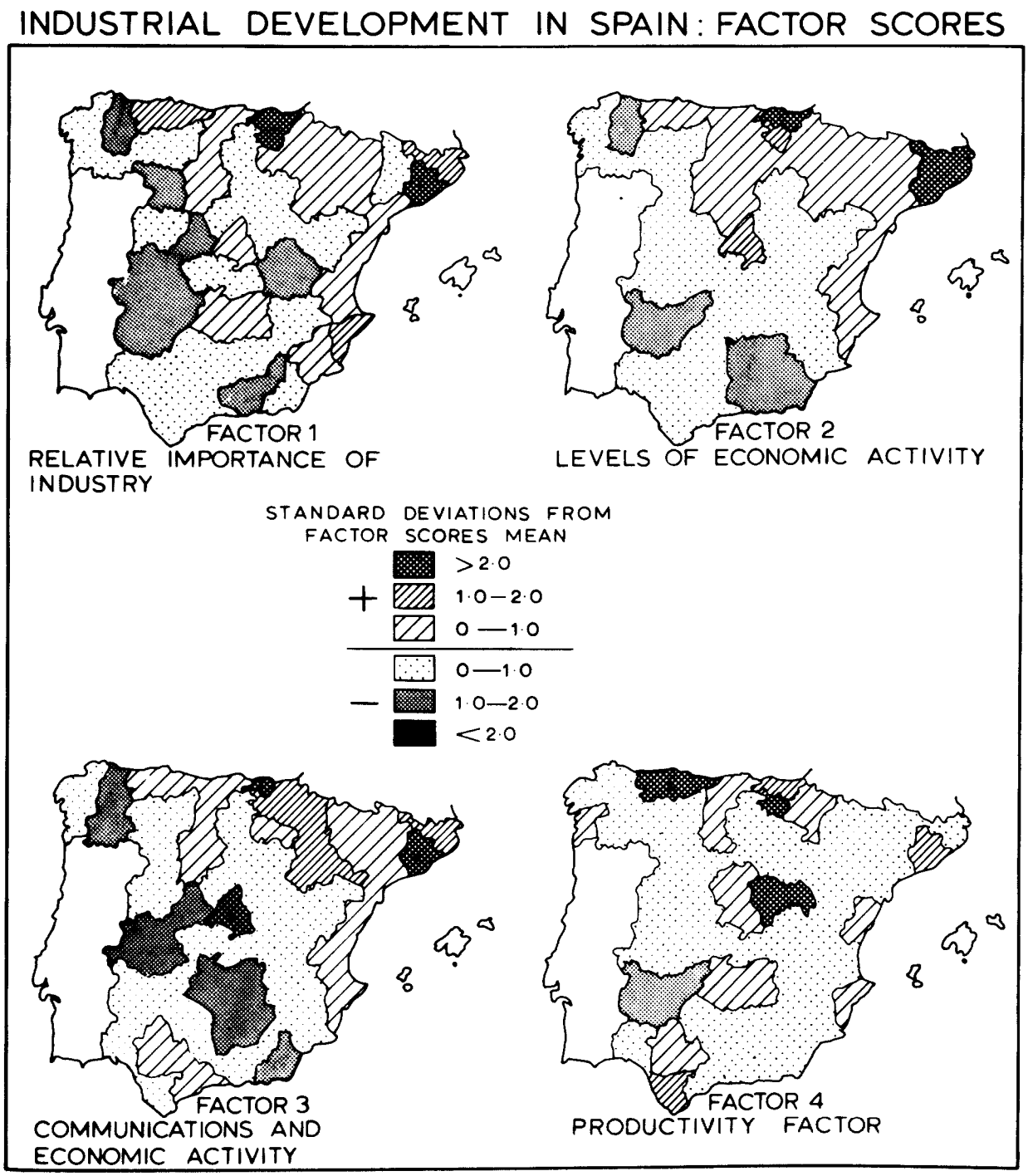
The factor pattern matrices, column standardized and conventionally scaled are given in Tables 4:18 and 4:19. Four factors were extracted and they display an overall I.F.S. of 0.86, which is very satisfactory. All the variables show high levels of factorial simplicity except for variable 10 and variable 8. The four factors, with their associated variables, are shown in Table 4:22. The most significant factor relationships are that factor 1 (the relative importance of industry) shows a high positive correlation with factors 2, 3 and 4, and factor 2 a high positive correlation with factor 3. These factor relationships show that the areas where industry is important have higher levels of economic activity, larger factories and higher wage rates.

Factor 1, which accounts for 59% of the variance explained, measures the relative importance of industrial production and industrial employment in Spain. Variable 10, the average number of workers per factory in the food industry is strongly correlated with this factor. However it should be remembered that variable 10 had low M.S.A. and I.F.S. levels, and not too much significance should be read into its behaviour.

Figure 4:2 clearly picks out Barcelona and the three Basque provinces as the areas where industry is relatively important. It also indicates that Madrid, despite its large industrial sector, is more important as a service centre. Throughout the rest of Spain there is a general tendency for industry to be relatively more important towards the Pyrenees and Europe, and less important towards the south and west. This pattern conforms to the results found in chapter 7.

Factor 2, which accounts for nearly 20% of the explained variance, clearly measures the levels of financial, commercial and overall economic activity in Spain. Figure 4:2 shows that factor 2 has a pattern of occurrence very similar to that of factor 1. The highest levels of economic activity are found in Barcelona, Gerona, the three Basque provinces and Madrid. Throughout the rest of the country there is the same tendency for

FIGURE 4:2


INDUSTRIAL DEVELOPMENT IN SPAIN: FACTOR SCORES
FACTOR 1
RELATIVE IMPORTANCE OF INDUSTRY
FACTOR 2
LEVELS OF ECONOMIC ACTIVITY
STANDARD DEVIATIONS FROM FACTOR SCORES MEAN
+
>2·0
1·0—2·0
0 —1·0
—
0—1·0
1·0—2·0
<2·0
FACTOR 3
COMMUNICATIONS AND ECONOMIC ACTIVITY
FACTOR 4
PRODUCTIVITY FACTOR

economic activity to be higher closer to Europe, and lower in the south and west.

Factor 3, which accounts for almost 15% of the explained variance, is associated with levels of communication and economic activity. High levels of economic activity require high levels of communications, and in their absence economic development is severely hampered. Also associated with this factor is the average number of workers per factory in both the textile and food industries. This indicates that the high levels of economic activity are linked to the larger sized factories. However this conclusion is contrary to the results found with factor 2 above although in conformity with factor 1. Similarly the level of financial activity is negatively correlated with the level of overall economic activity, which is also contrary to the results found with factor 2. These findings suggest that the underlying situation is very complex and are a warning against over-simplified interpretations.

Figure 4:2 shows that the pattern of occurrence is very similar to factors 1 and 2. Vizcaya, Barcelona and Madrid are the main centres of economic activity and communications. Throughout the rest of the country there is the familiar, although not quite so pronounced, tendency for activity to be higher in the north and east and lower in the south and west. This factor also shows a tendency for the coastal provinces to fare better than the provinces of the interior.

The last factor, which accounts for over 6% of the explained variance, is associated with high wage rates and high average numbers of workers per factory in the construction, glass and ceramics industries. Clearly this isolates the more advanced features of these industries, operating with larger factories and sufficiently productive to pay higher wage rates. Figure 4:2 shows that the construction, etc., industries are more advanced in the main industrial areas. However, the highest factor scores are found in Oviedo, which has many large construction works associated with the re-structuring of the coal and iron and steel industries, and in Álava and

TABLE 4:23

MEANS AND STANDARD DEVIATIONS

| | MEAN | SD |
|---|---|---|
| 1 | 0.6442E 05 | 0.2497E 06 |
| 2 | -0.4007E 03 | 0.1158E 06 |
| 3 | 0.1350E 04 | 0.9142E 04 |
| 4 | -0.1119E 03 | 0.7802E 03 |
| 5 | 0.2608E 04 | 0.7866E 03 |
| 6 | 0.1034E 02 | 0.4826E 01 |
| 7 | 0.1401E 01 | 0.1367E 01 |
| 8 | 0.9066E 02 | 0.2653E 02 |
| 9 | 0.2284E 03 | 0.2197E 03 |
| 10 | 0.3731E 05 | 0.8711E 04 |
| 11 | 0.6702E 01 | 0.5414E 01 |
| 12 | 0.3983E 02 | 0.2084E 02 |
| 13 | 0.1034E 02 | 0.6505E 01 |
| 14 | -0.2553E-02 | 0.8571E-01 |
| 15 | -0.1191E-01 | 0.3419E-01 |
| 16 | 0.1884E 03 | 0.1068E 02 |

TABLE

| | | | | |
|---|---|---|---|---|
| 1 | 1.0000 | 0.8940 | 0.8436 | -0.3380 |
| 2 | 0.8940 | 1.0000 | 0.9502 | -0.0811 |
| 3 | 0.8436 | 0.9502 | 1.0000 | 0.1313 |
| 4 | -0.3380 | -0.0811 | 0.1313 | 1.0000 |
| 5 | 0.4476 | 0.4116 | 0.2696 | -0.4363 |
| 6 | 0.5118 | 0.4545 | 0.3228 | -0.4757 |
| 7 | -0.0910 | -0.2415 | -0.0944 | 0.1797 |
| 8 | 0.5588 | 0.5495 | 0.4412 | -0.3180 |
| 9 | 0.1488 | 0.1832 | 0.1089 | -0.0884 |
| 10 | 0.5340 | 0.5976 | 0.4440 | -0.3834 |
| 11 | -0.1077 | -0.2241 | -0.1274 | 0.2079 |
| 12 | -0.4660 | -0.4530 | -0.3181 | 0.3348 |
| 13 | -0.3603 | -0.4691 | -0.3205 | 0.2626 |
| 14 | 0.1072 | 0.1131 | 0.0934 | -0.0766 |
| 15 | 0.2484 | 0.3455 | 0.2765 | -0.1376 |
| 16 | 0.1975 | 0.1424 | 0.0610 | -0.2720 |

| | | | | |
|---|---|---|---|---|
| 1 | -0.1077 | -0.4660 | -0.3603 | 0.1072 |
| 2 | -0.2241 | -0.4530 | -0.4691 | 0.1131 |
| 3 | -0.1274 | -0.3181 | -0.3205 | 0.0934 |
| 4 | 0.2079 | 0.3348 | 0.2626 | -0.0766 |
| 5 | -0.2736 | -0.5266 | -0.7808 | 0.2525 |
| 6 | -0.2062 | -0.5191 | -0.7269 | 0.2691 |
| 7 | 0.4095 | 0.1316 | 0.6335 | -0.0919 |
| 8 | -0.3048 | -0.8597 | -0.6084 | 0.2896 |
| 9 | -0.2564 | -0.4902 | -0.3961 | -0.1027 |
| 10 | -0.3219 | -0.7456 | -0.8363 | 0.2488 |
| 11 | 1.0000 | 0.2718 | 0.4107 | 0.0607 |
| 12 | 0.2718 | 1.0000 | 0.4962 | -0.0996 |
| 13 | 0.4107 | 0.4962 | 1.0000 | -0.2217 |
| 14 | 0.0607 | -0.0996 | -0.2217 | 1.0000 |
| 15 | -0.2468 | -0.3268 | -0.2946 | -0.2224 |
| 16 | -0.1349 | -0.1294 | -0.1539 | 0.1942 |

CORRELATION MATRIX

2:24

| | | | | | |
|---|---|---|---|---|---|
| 0.4476 | 0.5118 | -0.0910 | 0.5588 | 0.1488 | 0.5340 |
| 0.4116 | 0.4545 | -0.2415 | 0.5495 | 0.1832 | 0.5976 |
| 0.2696 | 0.3228 | -0.0944 | 0.4412 | 0.1089 | 0.4440 |
| -0.4363 | -0.4757 | 0.1797 | -0.3180 | -0.0884 | -0.3834 |
| 1.0000 | 0.9206 | -0.3563 | 0.6121 | 0.3922 | 0.7476 |
| 0.9206 | 1.0000 | -0.2851 | 0.6327 | 0.4284 | 0.7439 |
| -0.3563 | -0.2851 | 1.0000 | -0.3298 | -0.1647 | -0.5269 |
| 0.6121 | 0.6327 | -0.3298 | 1.0000 | 0.4851 | 0.8377 |
| 0.3922 | 0.4284 | -0.1647 | 0.4851 | 1.0000 | 0.4352 |
| 0.7476 | 0.7439 | -0.5269 | 0.8377 | 0.4352 | 1.0000 |
| -0.2736 | -0.2062 | 0.4095 | -0.3048 | -0.2564 | -0.3219 |
| -0.5266 | -0.5191 | 0.1316 | -0.8597 | -0.4902 | -0.7456 |
| -0.7808 | -0.7269 | 0.6335 | -0.6084 | -0.3961 | -0.8363 |
| 0.2525 | 0.2691 | -0.0919 | 0.2896 | -0.1027 | 0.2488 |
| 0.2293 | 0.1510 | -0.3143 | 0.3254 | 0.1425 | 0.4125 |
| 0.2750 | 0.2951 | 0.0497 | 0.1505 | 0.0753 | 0.1924 |

| | |
|---|---|
| 0.2484 | 0.1975 |
| 0.3455 | 0.1424 |
| 0.2765 | 0.0610 |
| -0.1376 | -0.2720 |
| 0.2293 | 0.2750 |
| 0.1510 | 0.2951 |
| -0.3143 | 0.0497 |
| 0.3254 | 0.1505 |
| 0.1425 | 0.0753 |
| 0.4125 | 0.1924 |
| -0.2468 | -0.1349 |
| -0.3268 | -0.1294 |
| -0.2946 | -0.1539 |
| -0.2224 | 0.1942 |
| 1.0000 | -0.0824 |
| -0.0824 | 1.0000 |

TABLE 4:25

SQUARED MULTIPLE CORRELATION COEFFICIENT (SMC) OF EACH VARIABLE WITH THE REMAINING P-1

| | SMC |
|---|---|
| 1 | 0,9493 |
| 2 | 0,9725 |
| 3 | 0,9780 |
| 4 | 0,8564 |
| 5 | 0,8920 |
| 6 | 0,9000 |
| 7 | 0,7181 |
| 8 | 0,8961 |
| 9 | 0,4374 |
| 10 | 0,9234 |
| 11 | 0,4743 |
| 12 | 0,8733 |
| 13 | 0,8565 |
| 14 | 0,4100 |
| 15 | 0,4104 |
| 16 | 0,2465 |

TABLE 4:26

MEASURE OF SAMPLING ADEQUACY (MSA) OF EACH VARIABLE

| | MSA |
|---|---|
| 1 | 0,6938 |
| 2 | 0,7349 |
| 3 | 0,5597 |
| 4 | 0,3941 |
| 5 | 0,8104 |
| 6 | 0,7971 |
| 7 | 0,5582 |
| 8 | 0,7765 |
| 9 | 0,8310 |
| 10 | 0,8239 |
| 11 | 0,5248 |
| 12 | 0,6877 |
| 13 | 0,8623 |
| 14 | 0,4627 |
| 15 | 0,7324 |
| 16 | 0,6040 |

OVERALL MEASURE OF SAMPLING ADEQUACY = 0,7116

TABLE 4:27

FACTOR PATTERN MATRIX (COLUMN STANDARDIZED)

| | | | | | |
|---|---|---|---|---|---|
| 1 | 1,2266 | 0,2813 | -0,1698 | 0,8434 | -2,2208 |
| 2 | 2,2282 | -0,2444 | -0,0079 | -0,8946 | -0,7241 |
| 3 | 2,9945 | 0,0579 | 0,0682 | 0,2851 | 0,6950 |
| 4 | 0,7214 | 0,0110 | -0,0585 | 0,3036 | 3,0753 |
| 5 | -0,0555 | 2,4940 | 0,1078 | -0,2487 | 0,0172 |
| 6 | 0,0090 | 2,7139 | 0,0483 | 0,2185 | -0,1603 |
| 7 | 0,0752 | 0,5476 | -0,5527 | 2,4035 | 0,2112 |
| 8 | 0,0514 | 0,0617 | -2,4433 | -0,1098 | 0,0932 |
| 9 | -0,0457 | 0,2957 | -0,6510 | 0,0355 | 0,3894 |
| 10 | 0,0797 | 0,4519 | -1,3302 | -1,7413 | -0,0623 |
| 11 | 0,0389 | 0,3652 | 0,0200 | 0,9571 | 0,1906 |
| 12 | 0,1169 | 0,2340 | 2,7208 | -0,3548 | 0,0740 |
| 13 | -0,0599 | -0,9224 | -0,1533 | 1,9313 | -0,3957 |
| 14 | 0,0189 | 0,4763 | -0,0699 | 0,1444 | 0,2203 |
| 15 | 0,0548 | -0,5279 | -0,2092 | -0,7413 | -0,1985 |
| 16 | -0,0324 | 0,3638 | 0,0740 | 0,2016 | -0,2863 |

TABLE 4:28

FACTOR PATTERN MATRIX (CONVENTIONALLY SCALED), SALIENTS MARKED WITH ASTERISK

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 0,65* | 0,07 | -0,04 | 0,18 | -0,45* |
| 2 | 0,87* | -0,05 | -0,00 | -0,14 | -0,11 |
| 3 | 1,05* | 0,01 | 0,01 | 0,04 | 0,09 |
| 4 | 0,65 | 0,00 | -0,02 | 0,11 | 1,05* |
| 5 | -0,04 | 0,92* | 0,04 | -0,08 | 0,01 |
| 6 | 0,01 | 0,96* | 0,02 | 0,06 | -0,05 |
| 7 | 0,09 | 0,33 | -0,33 | 1,18* | 0,10 |
| 8 | 0,04 | 0,02 | -0,88* | -0,03 | 0,03 |
| 9 | -0,08 | 0,25 | -0,55 | 0,02 | 0,26 |
| 10 | 0,05 | 0,14 | -0,41* | -0,45* | -0,02 |
| 11 | 0,07 | 0,30 | 0,02 | 0,64 | 0,12 |
| 12 | 0,10 | 0,09 | 1,08* | -0,12 | 0,02 |
| 13 | -0,05 | -0,39 | -0,06 | 0,68* | -0,14 |
| 14 | 0,03 | 0,41 | -0,06 | 0,10 | 0,15 |
| 15 | 0,10 | -0,45 | -0,18 | -0,53 | -0,14 |
| 16 | -0,07 | 0,35 | 0,07 | 0,16 | -0,22 |

TABLE 4:29

INDEX OF FACTORIAL SIMPLICITY FOR EACH VARIABLE

| | IFS |
|---|---|
| 1 | 0,6272 |
| 2 | 0,7368 |
| 3 | 0,9262 |
| 4 | 0,9248 |
| 5 | 0,9848 |
| 6 | 0,9873 |
| 7 | 0,8739 |
| 8 | 0,9943 |
| 9 | 0,5849 |
| 10 | 0,6036 |
| 11 | 0,8105 |
| 12 | 0,9673 |
| 13 | 0,7466 |
| 14 | 0,7047 |
| 15 | 0,5681 |
| 16 | 0,4731 |

OVERALL INDEX OF FACTORIAL SIMPLICITY = 0,89

TABLE 4:30

FACTOR INTERCORRELATION MATRIX

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 1.0000 | 0.4031 | -0.5108 | -0.4063 | -0.5587 |
| 2 | 0.4031 | 1.0000 | -0.7238 | -0.7571 | -0.6421 |
| 3 | -0.5108 | -0.7238 | 1.0000 | 0.7175 | 0.6178 |
| 4 | -0.4063 | -0.7571 | 0.7175 | 1.0000 | 0.4693 |
| 5 | -0.5587 | -0.6421 | 0.6178 | 0.4693 | 1.0000 |

Guadalajara, which both act as overspill areas for their neighbouring industrial regions. High levels are also reached in Cádiz, presumably the result of the construction projects of Cádiz bay and the Campo de Gibraltar plan.

In considering the four industrial factors it is important to note that these factors are highly inter-correlated, and that the patterns of factor scores shown on Figure 4:2 are very similar. This suggests that there may be only one important factor operating here, 'industrialization', which reaches its greatest levels in the Basque provinces and Catalonia, and which steadily declines towards the south and west.

Factor Analysis of Social Underdevelopment in Spain

Data for the 16 variables listed in Table 4:4 were analysed. The means and standard deviations are given in Table 4:23, and the correlation matrix and the squared multiple correlation coefficients shown in Tables 4:24 and 4:25. The overall M.S.A. of the data is 0.7116 which is quite acceptable. Most of the individual variables lie above the 0.50 level, and the two variables that lie below are fairly close to this level of acceptability.

The factor pattern matrices, column standardized and conventionally scaled, are given in Tables 4:27 and 4:28. Five factors were extracted and they display an overall I.F.S. of 0.89 which is highly satisfactory. All the variables show high individual levels of factorial simplicity except for variable 16, the rise in the cost of living, but which nevertheless remains very close to the level of acceptability. The five factors, with their associated variables, are shown in Table 4:31. The most significant factor relationships are factor 1 with factor 3, showing that areas with high levels of demographic increase are areas of greater family wealth and better quality housing, factor 2 with factors 3, 4 and 5, showing that high levels of education are positively correlated with high levels of family wealth and family social status and low levels of selective demographic change, and factor 3 with factors 4 and 5, showing that high levels of family wealth and housing are positively correlated with high levels of

TABLE 4:31

The Social Factors.

| Relationship | | Variable No. | Description | Factor 1 |
|---|---|---|---|---|
| i) | 1.05 | 3 | selective demographic change (young) | Demographic change 57.1% |
| ii) | 0.87 | 2 | overall demographic change | |
| iii) | 0.65 | 1 | overall demographic change | |
| iv) | 0.65 | 4 | selective demographic change (professions) | |

| Relationship | | Variable No. | Description | Factor 2 |
|---|---|---|---|---|
| i) | 0.96 | 6 | higher education | Education 12.9% |
| ii) | 0.92 | 5 | basic education | |
| iii) | -0.45 | 15 | changing employment structure (salaried workers) | |

| Relationship | | Variable No. | Description | Factor 3 |
|---|---|---|---|---|
| i) | -1.08 | 12 | quality of housing | Family wealth and housing 12.8% |
| ii) | 0.88 | 8 | index of household consumption | |
| iii) | 0.41 | 10 | per capita family income | |
| iv) | 0.55 | 9 | investment in infrastructure and social services | |

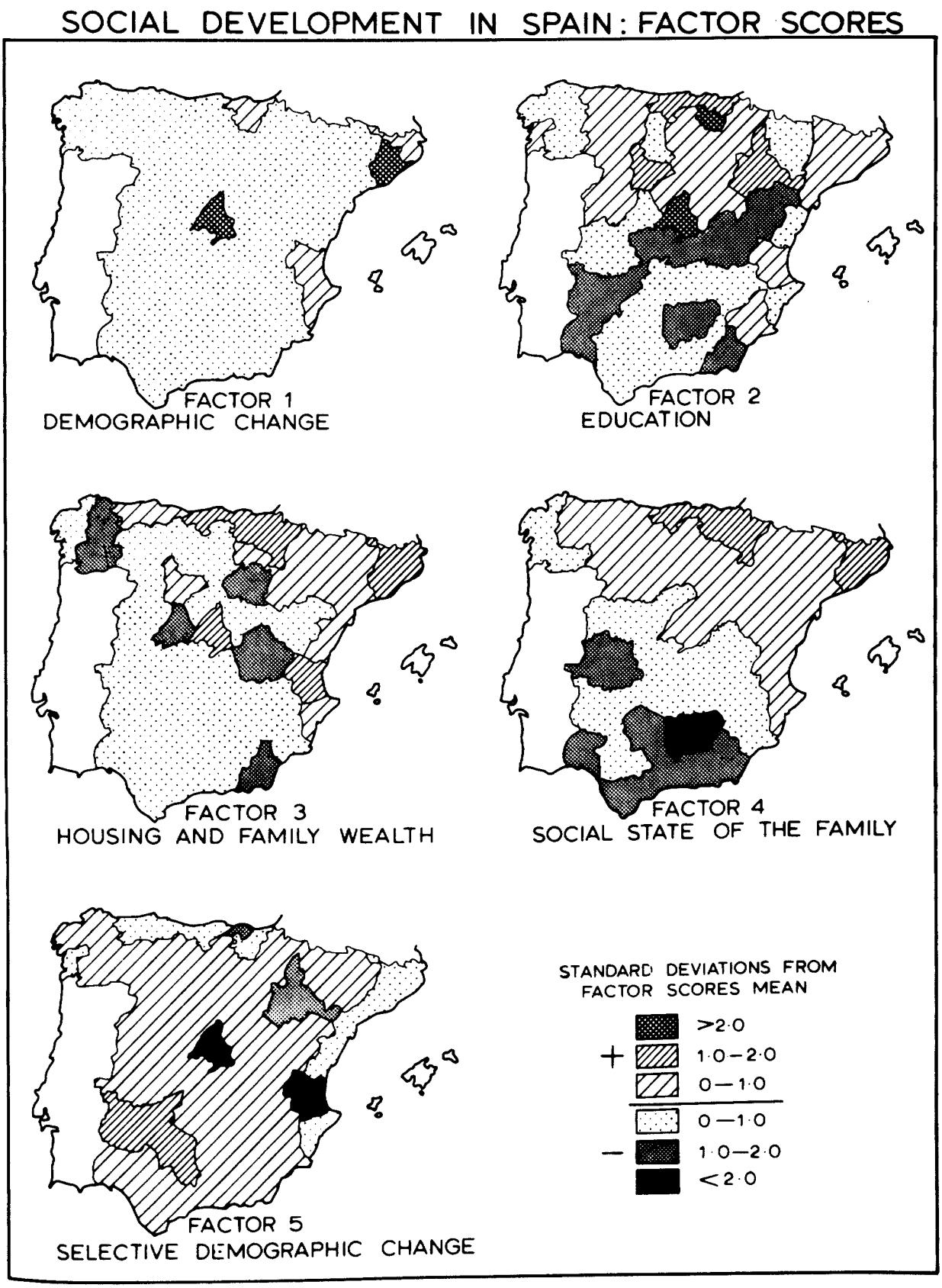
| Relationship | | Variable No. | Description | Factor 4 |
|---|---|---|---|---|
| i) | -1.18 | 7 | unemployment | Social state of the family 8.8% |
| ii) | -0.68 | 13 | literacy rates | |
| iii) | 0.45 | 10 | per capita family income | |
| iv) | -0.64 | 11 | overcrowding | |
| v) | 0.53 | 15 | employment structure (salaried workers) | |

TABLE 4:31 cont.

| Relationship | | Variable No. | Description | Factor 5 |
|---|---|---|---|---|
| i) | 1.05 | 4 | selective demographic change (professions) | Selective demographic change 8.3% |
| ii) | -0.45 | 1 | overall population change | |

Note: the conventions and sources used in this table are the same as those used in Table 4:13.

FIGURE 4:3


SOCIAL DEVELOPMENT IN SPAIN: FACTOR SCORES
FACTOR 1
DEMOGRAPHIC CHANGE
FACTOR 2
EDUCATION
FACTOR 3
HOUSING AND FAMILY WEALTH
FACTOR 4
SOCIAL STATE OF THE FAMILY
FACTOR 5
SELECTIVE DEMOGRAPHIC CHANGE
STANDARD DEVIATIONS FROM FACTOR SCORES MEAN
+
>2·0
1·0–2·0
0—1·0
—
0—1·0
1·0—2·0
<2·0

family social status and low levels of selective demographic change (Table 4:30). The one anomaly is the negative correlation between factors 1 and 5, and which is discussed below.

Factor 1, which accounts for 57.1% of the explained variance, indicates the presence of total demographic change and selective demographic change. This shows that those areas associated with immigration and population increase are those areas which gain the highest proportion of the young and professionally qualified. Figure 4:3 shows that most of Spain suffers from the adverse affects of demographic change. Madrid and Barcelona are the overwhelming beneficiaries, with Alicante, Valencia, Gerona and the three Basque provinces also benefitting.

Factor 2, which accounts for almost 13% of the explained variance, has isolated the education factor in Spanish society, including both general and higher education. The area which benefits most from this factor is northern Spain, especially Madrid and Álava, and the area which suffers most is southern Spain and Galicia. This reflects an older 'education tradition' in northern Spain associated with the old university towns of Salamanca, Valladolid and Saragossa, etc., and the Catalan and to a lesser extent the Basque cultural traditions. There is a dearth of universities and higher education establishments in southern and western Spain.

Factor 3, which accounts for almost 13% of the explained variance, is associated with family wealth and housing. Not surprisingly the wealthier families live in areas of better quality housing, and in areas where local authorities spend more per capita on infrastructure and social services. North and east Spain benefits most from this factor (figure 4:3), especially Madrid, Valencia, Catalonia and the Basque provinces. The areas which benefit least are again the poor provinces of central Spain, south and western Spain, and Galicia.

Factor 4, which accounts for nearly 9% of the explained variance, is associated with the social state of the family, especially low unemployment and illiteracy rates and high family incomes. It is also associated with a

lack of overcrowding and a high availability of housing. Figure 4:3 shows that the areas of highest social status are Catalonia and the Basque region, and that there is a steady decline towards the south-west with Jaén forming an absolute low. This pattern follows very closely the gradient effect noted in chapter 7.

The last factor, which accounts for over 8% of the explained variance, is a measure of selective demographic change. This factor has highlighted those areas which have only a small increase or even a decrease in population, but which nevertheless have a large immigration flow of professionally qualified persons. This shows an opposite effect to Factor 1 and appears to represent a reverse flow of professionals back to the poorer regions of Spain. The concept of the reverse flow is well known in migration studies, and was certainly made explicit by Ravenstein as early as 1885[48]. However, it is important here to look at the size of the two factors. Factor 1 accounts for 57.1% of the explained variance whereas factor 5 only accounts for 8.3%. This indicates that the equilibriating reverse flow is much smaller than the disequilibriating original flow. Figure 4:3 shows that the areas which benefit most from factor 5 are the traditionally poorer areas of Spain, especially Badajoz and Córdoba. The areas which benefit least are Madrid and Valencia, and the Catalan and Basque provinces. This pattern confirms the suggestion that factor 5 can be considered a small equilibriating force tending to benefit the poorer areas.

Cluster Analysis of the Results

So far the information gained about the geography of 'economic health' has been obtained from factor score maps, one factor at a time. In order to obtain an overall picture of the state of agriculture, industry and social development in Spain a second analysis was performed to consider all the relevant factor scores together. This was achieved through the use of cluster analysis, which is a method for grouping together objects or areas with similar characteristics. In statistical terms this method tends to minimize within-group variance and maximize between-group variance. In

this study each province was grouped into a cluster with other provinces which have a similar pattern of factor scores.

Cluster analysis was developed by taxonomists as a method for deducing the lineage of biological organisms from their characteristics and similarities. Cluster analysis has been adopted for use in other sciences as a grouping and classification procedure[50]. In geography it has been found to be of particular use in defining homogeneous regions. B.J.L. Berry[51] and N.A. Spence[52] have made notable contributions in this field, and the concept of the homogeneous region as an areal classification has gained wide acceptance[53]. At the present time the theoretical underpinnings of cluster analysis are incomplete[54], nevertheless existing methods have been used with great practical success in the arrangement of objects into hierarchical classifications.

The Method Used in This Study

For each area $n$, there is a set of scores on $m$ factors, so that the complete data set forms an $n \times m$ matrix. Several measures of similarity or resemblance between areas are available; the one used here is the standardized Euclidean distance, $d_{ij}$. This coefficient measures the dissimilarity of areas $i$ and $j$, in that the value of $d_{ij}$ approaches zero as similarity increases. The other main type of similarity measure based on the correlation coefficient is not appropriate for the comparison of areas. The distance coefficient is defined as:-

$$d_{ij} = \frac{\sqrt{\sum_{k=1}^{m} (X_{ik} - X_{jk})^2}}{m}$$

where $X_{ik}$ denotes the $k$th variable measured on area $i$ and $X_{jk}$ the $k$th variable measured on area $j$. In all $m$ variables are measured on each area, and $d_{ij}$ is the distance between areas $i$ and $j$. From the $n \times m$ matrix of distance coefficients areas with the lowest $d_{ij}$'s

are grouped together to form the centres of clusters. The similarity matrix of distance coefficients is then recomputed and areas with increasingly larger $d_{ij's}$ are formed into new clusters or linked to existing clusters. These groupings and linkages are usually displayed in a graphical form as a dendrogram or linkage tree. To avoid the problem of later areas having a greater influence on the cluster than those linked earlier, the unweighted pair-group method was used. This weights each cluster in proportion to the number of areas already contained within it. This method has been found to be the most satisfactory for general classification purposes[55].

The clustering technique used was that developed by R.B. McCammon and modified by P.M. Mather for use on the University of Nottingham 1906 A computer. This program uses a distance coefficient as the similarity measure and proceeds according to the unweighted pair-group method[56]. There are two features unique to McCammon's algorithm. The first is that the variables are ordered, giving a pyramidal shape to the dendrogram, preserving where possible the original rank-order position of the variables. This gives a hierarchical form which is very suitable for the interpretation of biological phenomena which have evolved from a common source. Although in this study no such structural assumptions can be made, this dendrogram form is perfectly satisfactory and provides a clear and readily interpretable graphical form. The second and more important feature introduced by McCammon is that his dendrogram displays between-group variance as well as within-group variance. This new graphical form has been named by McCammon the dendrograph[57]. With this new form the clusters of areas can be discerned more easily and more accurately.

The data used were the factor scores from each of the three factor analysis studies. Thus three cluster analyses were performed. Each factor score was given an equal weight in the analysis. It can be argued that this will lead to distortion because of the widely differing importance of the factors as indicated by their differing contributions to the percentage

TABLE 4:32

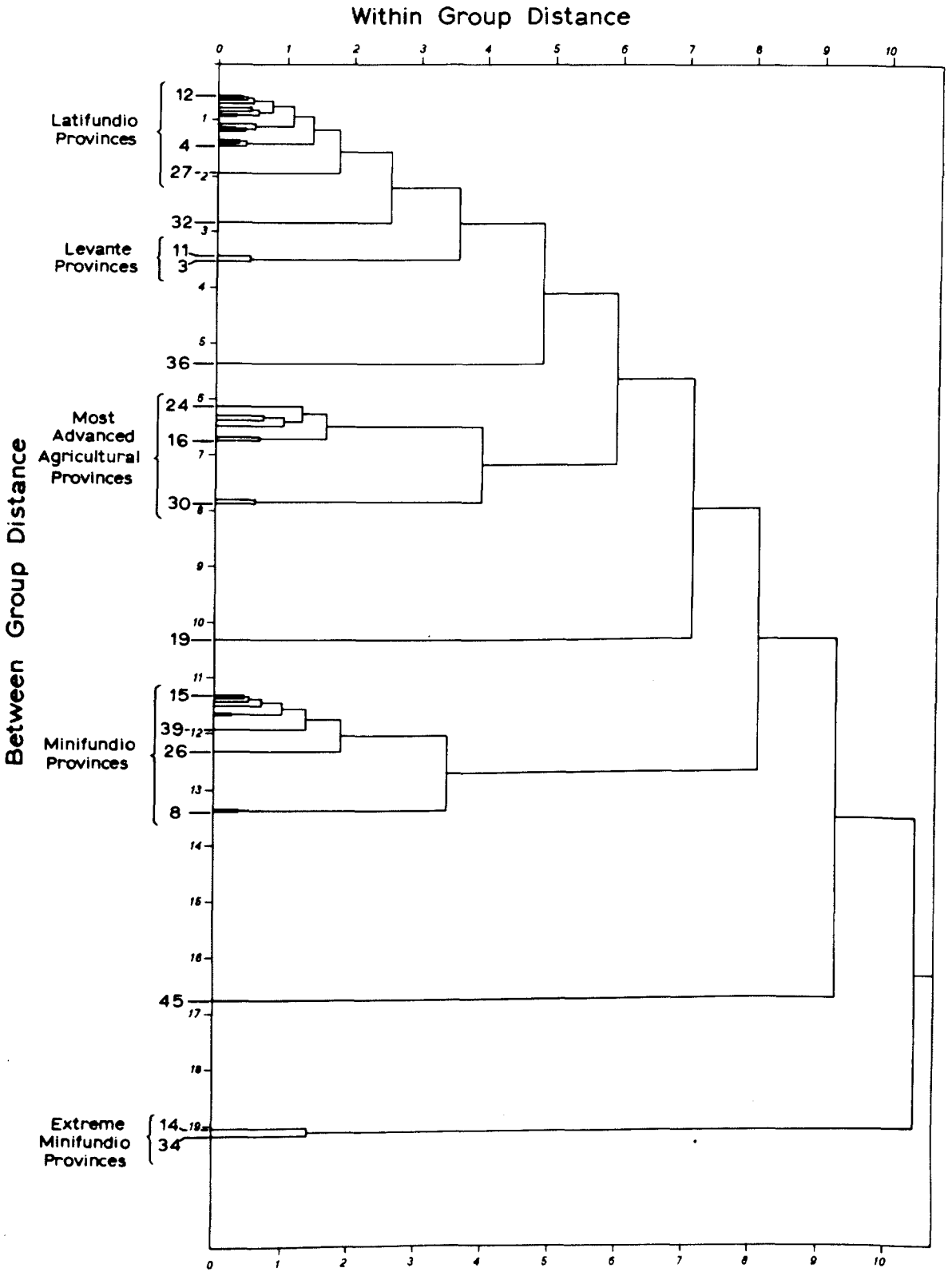
Numbering of the 47 Mainland Provinces used in the Cluster Analysis.

1) Alava
2) Albacete
3) Alicante
4) Almería
5) Avila
6) Badajoz
7) Barcelona
8) Burgos
9) Cáceres
10) Cádiz
11) Castellón
12) Ciudad Real
13) Córdoba
14) Corunna
15) Cuenca
16) Gerona
17) Granada
18) Guadalajara
19) Guipúzcoa
20) Huelva
21) Huesca
22) Jaén
23) León
24) Lérida
25) Logroño
26) Lúgo
27) Madrid
28) Málaga
29) Murcia
30) Navarre
31) Orense
32) Oviedo
33) Palancia
34) Pontevedra
35) Salamanca
36) Santander
37) Segovia
38) Seville
39) Soria
40) Tarragona
41) Teruel
42) Toledo
43) Valencia
44) Valladolid
45) Vizcaya
46) Zamora
47) Saragossa

Note: these numbers are used in Figures 4:4, 4:6, 4:8, and in Tables 4:33, 4:34, and 4:35.

FIGURE 4:4

DENDROGRAPH DEPICTING THE SPATIAL ARRANGEMENT OF AGRICULTURAL REGIONS IN SPAIN



explanation. On the other hand a large proportion of this difference is due to the number and type of variables used in the factor analysis. The size and importance of each of the factors remains largely unknown, so that to treat each factor as having an equal importance is not necessarily more arbitrary than any other method of treating the factor scores.

The Results

From the five agricultural factors three main clusters emerge (Figure 4:4). The first cluster consists of a core area of provinces 12 - 4 (see Table 4:33) which are the latifundio provinces of the south and west. The provinces of Saragossa and Teruel are included in this core area. The features of this first group, apart from being a predominately latifundio region, consist of low intensities of agricultural and especially livestock production, and very low levels of mechanization and modern farming methods. This group forms the most backward and poorest agricultural region of Spain. Also associated with this group is the province of Madrid, which lies at the northern extension of the latifundio region of Spain. The position of Oviedo on the fringe of this group is less easily explained, although it has already been noted that Oviedo is not included in the minifundio area as measured by Factor 3 above.

The Mediterranean provinces from Alicante to Tarragona form a distinct sub-group in between the latifundio group and the wealthier northern group of provinces. This intermediate position would appear to reflect the fact that each of these provinces has coastal huerta lands which are amongst the richest agricultural areas in Spain, and poor interiors where latifundios predominate. Examination of the dendrograph (Figure 4:4) suggests that in terms of within-group and between-group variance, Santander should be included with the second cluster, even though this would partly violate the hierarchical 'pyramid form' assumption mentioned above.

The second core group consists of the most advanced agricultural provinces in Spain. Some of these provinces have a high intensity of

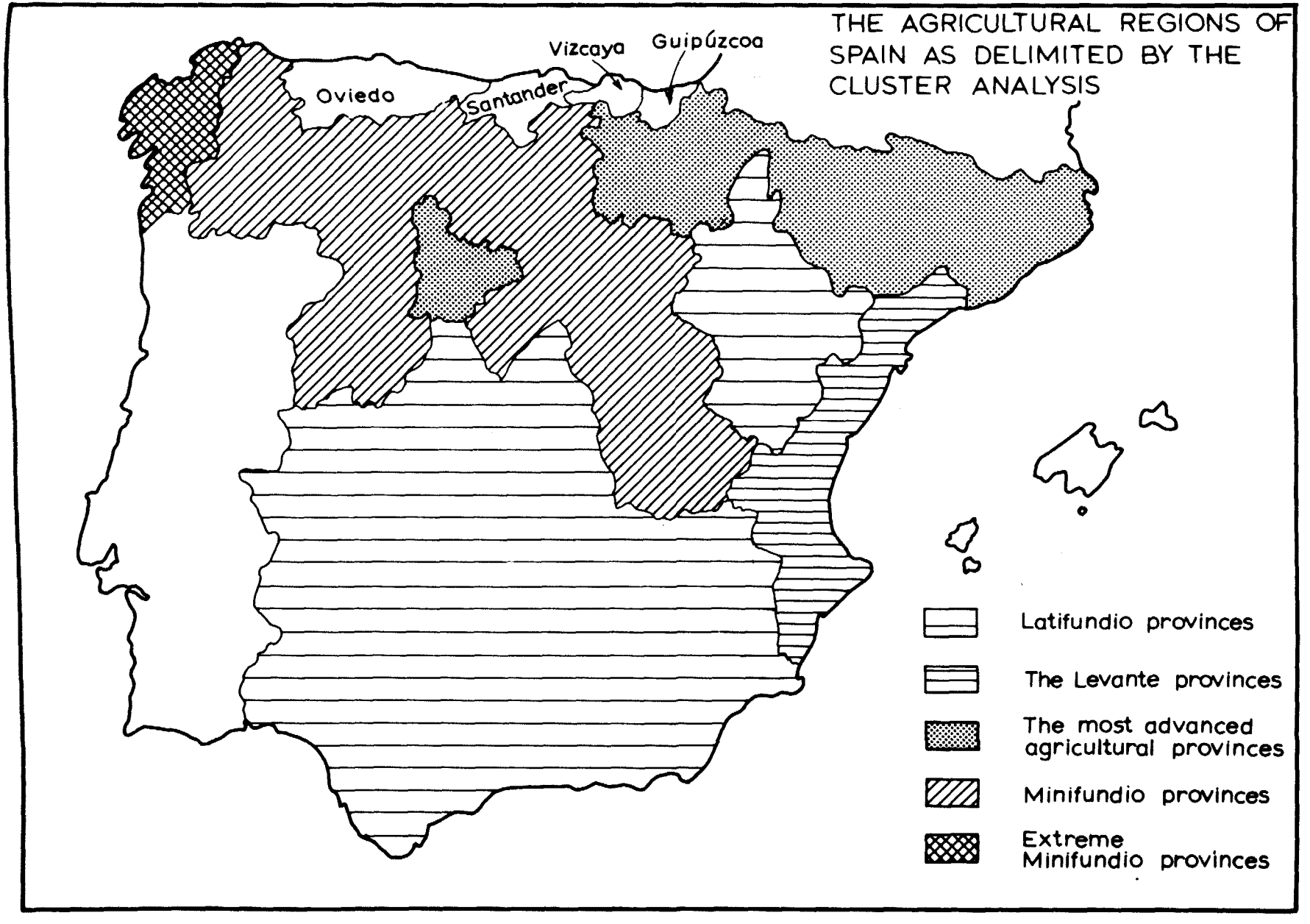

THE AGRICULTURAL REGIONS OF SPAIN AS DELIMITED BY THE CLUSTER ANALYSIS
Vizcaya
Guipúzcoa
Oviedo
Santander
Latifundio provinces
The Levante provinces
The most advanced agricultural provinces
Minifundio provinces
Extreme Minifundio provinces

FIGURE 4:5

agricultural production as measured by factor 1, and several have marked urban farming patterns (factor 2). All of the provinces are strongly associated with modern and productive farming methods. The third main cluster, including the province Vizcaya, consists of the minifundio provinces of Spain as indicated by factor 3 above. Lastly the provinces of Corunna and Pontevedra form an extreme subgroup within the minifundio area, but are also provinces with a high intensity of agricultural production, including both livestock and non-livestock production.

In general the cluster analysis indicates that agricultural development is very closely associated with the main farming systems in operation, especially the latifundios and the minifundios, and that the poorest agricultural regions of Spain occur in areas where the latifundios predominate.

The provinces of Spain, when measured by the scores from the four industrial factors, group into three widely separated clusters, with the first cluster dividing into two sub-groups (Figure 4:6 and Table 4:34). The first subgroup forms the most backward industrial area of Spain. Not only is this the least important industrial region of Spain (factor 1), but it also has the lowest levels of financial, commercial and general economic activity within the country (factors 2 and 3).

The second sub-group has similar general characteristics to the first, except that industrial development appears to have made slightly more progress. These two sub-groups make up the whole of central, southern and western Spain (Figure 4:7). Thus despite the existence of large prestige industrial projects in provinces such as Ciudad Real and Huelva, the general level of industrial development in these provinces remains at or near the very low level of the surrounding region.

North-eastern Spain and the Levante form the nation's main industrial region. The variance pattern suggests that Oviedo also should be included within this region. Industrial development (factor 1) is quite pronounced in all these provinces except for Burgos and Lérida. Similarly this region is almost precisely defined by factors 2 and 3, which measure the levels of

FIGURE 4:6

DENDROGRAPH DEPICTING THE SPATIAL ARRANGEMENT OF INDUSTRIAL REGIONS IN SPAIN

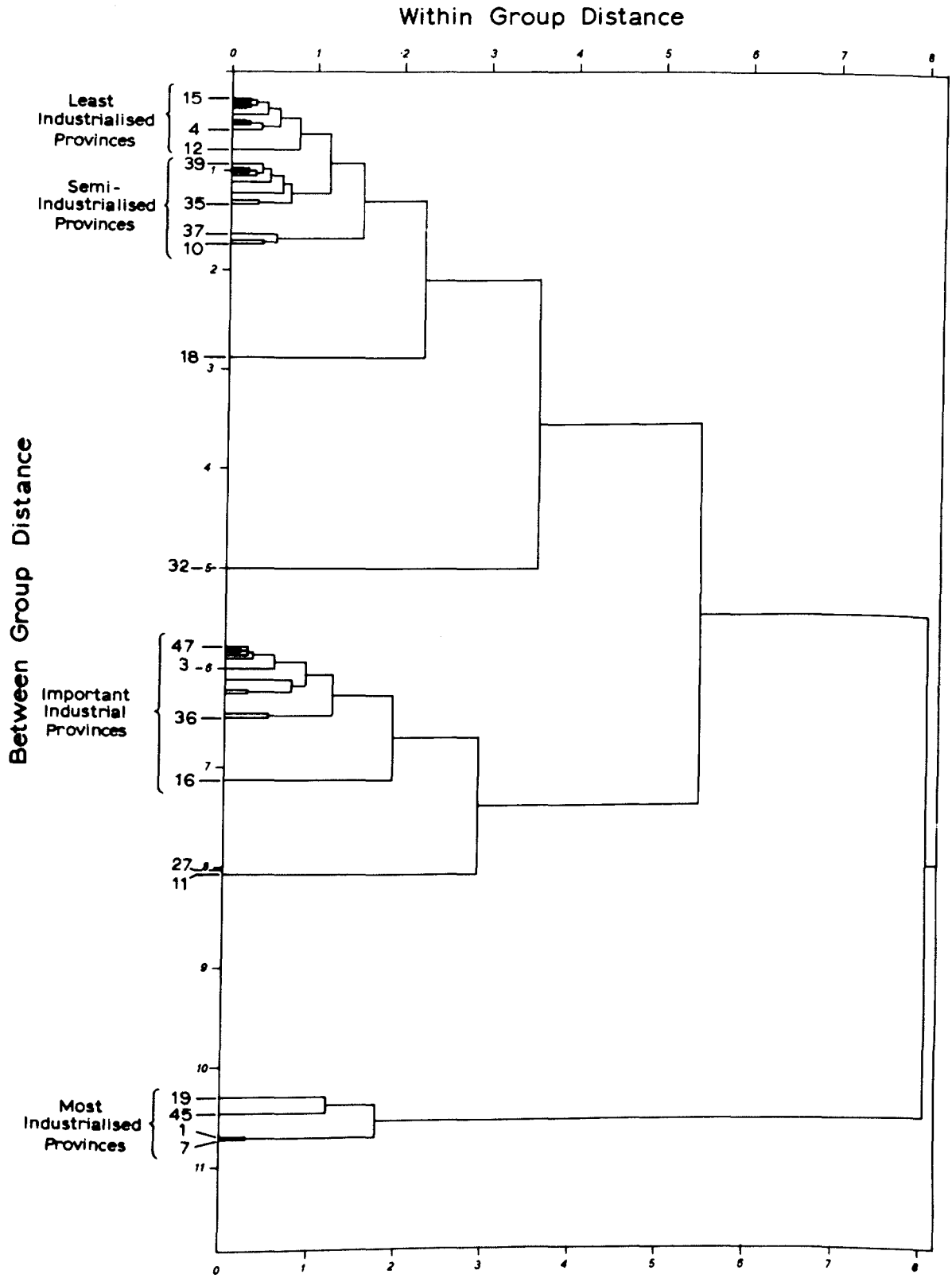


TABLE 4:34

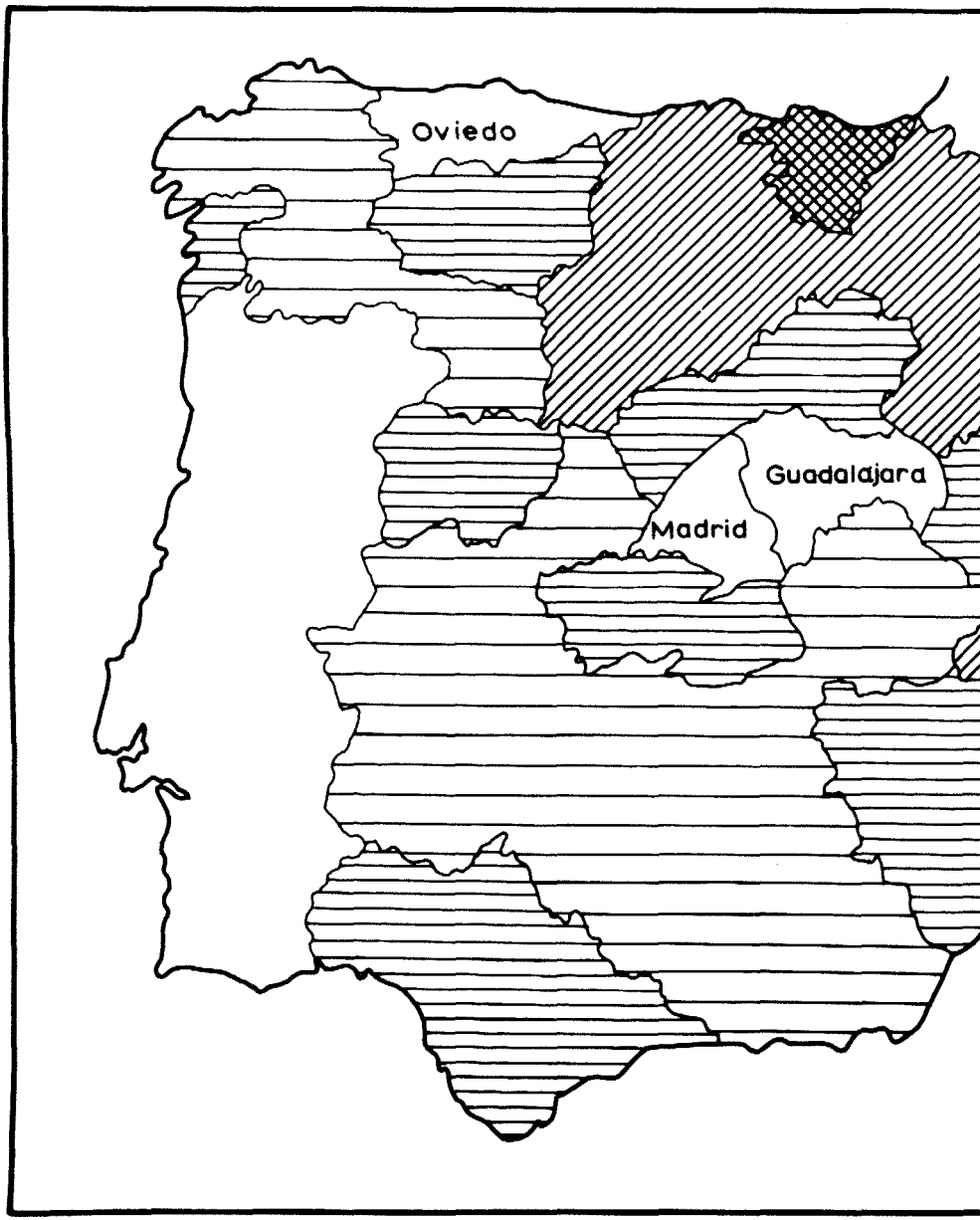
| NP | ORDER | WGR | BGR |
|---|---|---|---|
| 15 | 3 | 0.0491 | 0.0491 |
| 46 | 12 | 0.1669 | 0.2258 |
| 5 | 17 | 0.2406 | 0.2883 |
| 17 | 13 | 0.1712 | 0.1994 |
| 26 | 7 | 0.1149 | 0.1149 |
| 9 | 25 | 0.3757 | 0.7133 |
| 6 | 29 | 0.5179 | 0.6647 |
| 14 | 9 | 0.1178 | 0.1178 |
| 22 | 11 | 0.1655 | 0.2027 |
| 13 | 22 | 0.3025 | 0.5081 |
| 31 | 4 | 0.0642 | 0.0642 |
| 4 | 34 | 0.7437 | 1.9858 |
| 12 | 36 | 1.1069 | 1.4770 |
| 39 | 23 | 0.3278 | 0.4965 |
| 42 | 8 | 0.1172 | 0.1361 |
| 20 | 10 | 0.1524 | 0.1876 |
| 41 | 18 | 0.2435 | 0.3801 |
| 2 | 26 | 0.4122 | 0.6231 |
| 23 | 31 | 0.5687 | 1.0384 |
| 29 | 32 | 0.6674 | 0.8643 |
| 28 | 21 | 0.2809 | 0.2809 |
| 38 | 5 | 0.0796 | 0.0796 |
| 35 | | | |

| NP | ORDER | WGR | BGR |
|---|---|---|---|
| 35 | 39 | 1.5061 | 3.0135 |
| 37 | 28 | 0.5020 | 0.5819 |
| 34 | 24 | 0.3423 | 0.3423 |
| 10 | 42 | 2.2380 | 11.3871 |
| 18 | 44 | 3.5972 | 21.2658 |
| 32 | 45 | 5.5163 | 7.8929 |
| 47 | 14 | 0.2103 | 0.2939 |
| 33 | 6 | 0.1115 | 0.1534 |
| 44 | 15 | 0.2140 | 0.3166 |
| 21 | 20 | 0.2780 | 0.3739 |
| 43 | 30 | 0.5257 | 1.0212 |
| 3 | 35 | 0.8798 | 1.1073 |
| 8 | 33 | 0.7286 | 1.0710 |
| 40 | 16 | 0.2294 | 0.2294 |
| 24 | 2 | 0.0430 | 0.0430 |
| 25 | 38 | 1.2002 | 2.0345 |
| 30 | 27 | 0.4685 | 0.4685 |
| 36 | 41 | 1.9055 | 6.1373 |
| 16 | 43 | 2.9187 | 9.5040 |
| 27 | 1 | 0.0276 | 0.0276 |
| 11 | 46 | 8.1739 | 22.3504 |
| 19 | 37 | 1.1750 | 1.6353 |
| 45 | 40 | 1.7541 | 2.3332 |
| 1 | 19 | 0.2544 | 0.2544 |
| 7 | | | |

NP = Number of province

WGR= Within group variance

BGR= Between group variance


Oviedo
Guadalajara
Madrid

THE INDUSTRIAL REGIONS OF SPAIN AS DELIMITED BY THE CLUSTER ANALYSIS.




FIGURE 4:7

financial, commercial and general economic activity in Spain. This very pronounced concordance between the first three industrial factors and the main industrial region emphasises the importance of the boundary which defines this group, and indicates the clear division which exists between the industrially advanced and industrially backward regions.

Lastly there is the third group which forms two industrial core areas within the advanced region. This group consists of the three Basque provinces and Barcelona, with the provinces of Madrid and Castellón occupying an intermediate position between this and the previous group.

The factor scores on the social structure variables group into four main clusters, with Barcelona and Madrid forming important outliers (Figure 4:8). The first cluster consists of a number of provinces of Old Castile and Seville, Huesca, Castellón, Alicante and Murcia (Figure 4:8 and Table 4:35). This group has above average levels of education, but is also associated with out-migration, poorer housing conditions and low family incomes (factors 1 and 3). The second cluster consists of three Catalan provinces together with Saragossa, Valladolid and Oviedo (Figure 4:9). Again there is a strong link with higher levels of education (factor 2), but in this group the association is with high standards in housing, family wealth and the social state of the family. The third cluster forms the socially most advanced region of Spain and consists of the three Basque provinces, Navarre and Santander (Figure 4:9). This region is strongly and positively associated with the first four factors in the analysis of social structure.

The fourth cluster consists of the provinces of the south together with Lugo and Orense (Figure 4:9). This group forms the socially most backward region of Spain, and is associated with out-migration (factor 1), very low levels of education, low standards of housing and family wealth, and low levels in the social state of the family (factors 2, 3 and 4). Lastly there are the two outliers, Madrid and Barcelona, which are overwhelmingly associated with in-migration (factor 1) and also have high standards of housing, family income and status (factors 2 and 3).

FIGURE 4:8

# DENDROGRAPH DEPICTING THE SPATIAL ARRANGEMENT OF SOCIAL REGIONS IN SPAIN

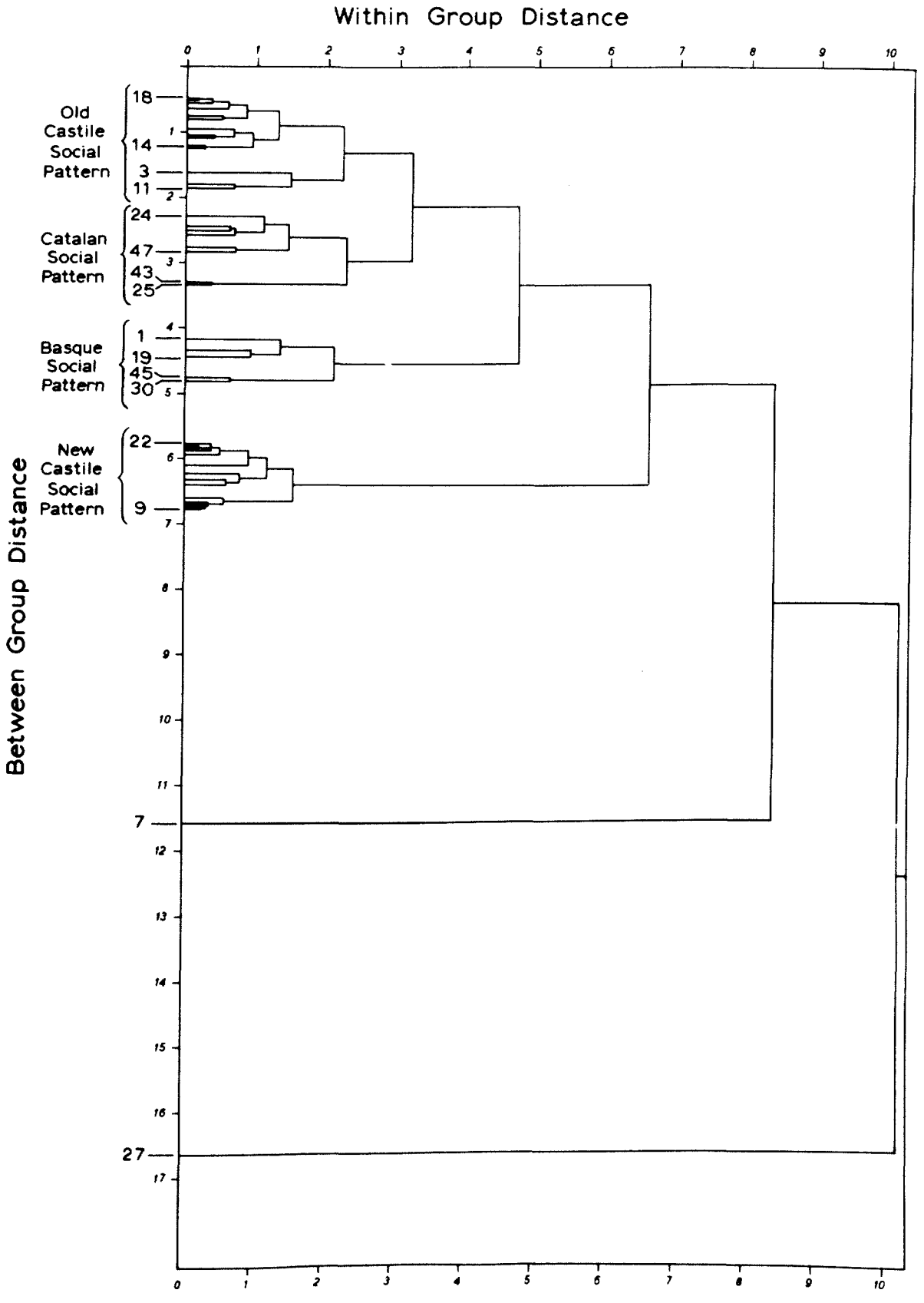


TABLE 4:35

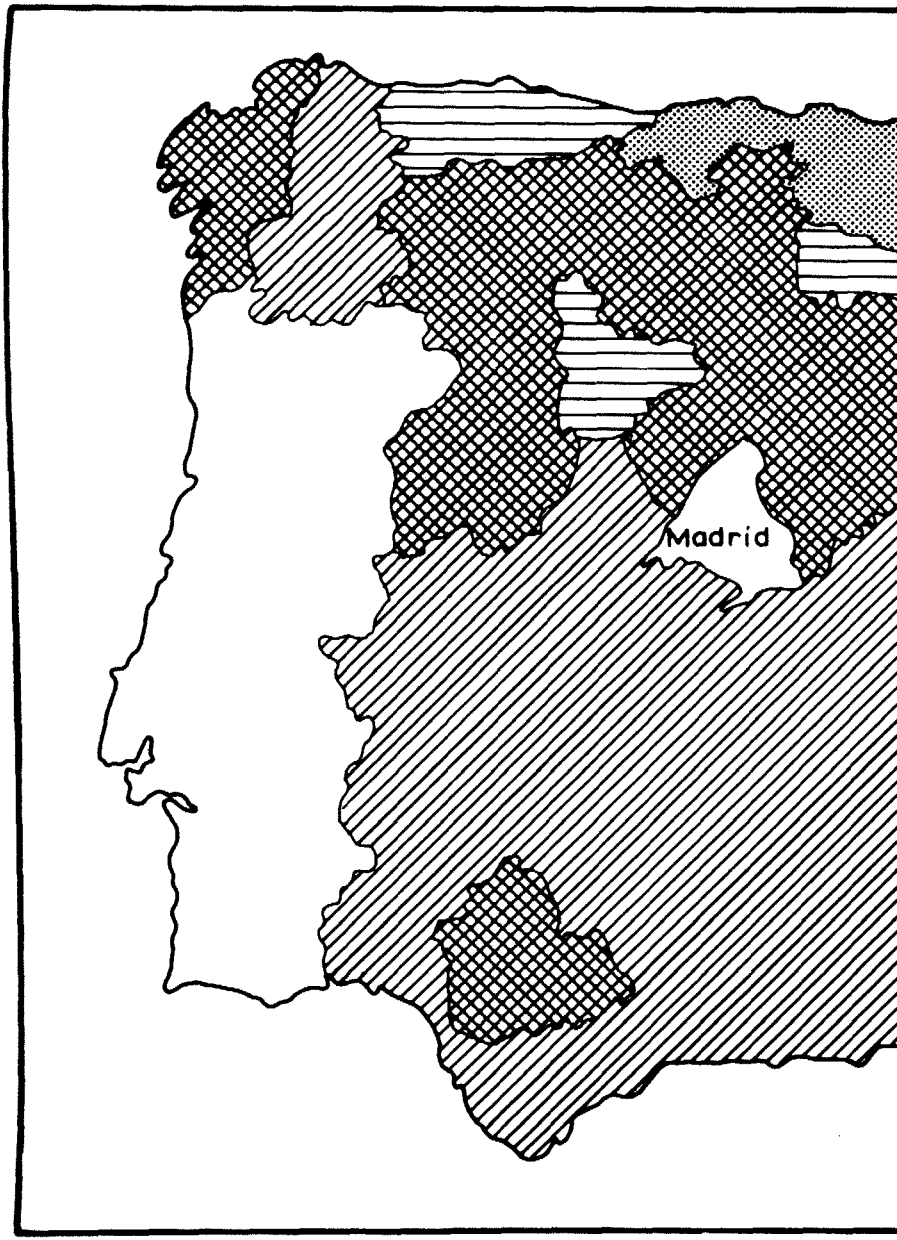
| NP | ORDER | WGR | BGR |
|---|---|---|---|
| 18 | 3 | 0.0730 | 0.0730 |
| 46 | 5 | 0.1221 | 0.1467 |
| 39 | 11 | 0.3014 | 0.4806 |
| 33 | 19 | 0.5295 | 0.8717 |
| 8 | 28 | 0.8043 | 1.1177 |
| 23 | 16 | 0.4189 | 0.4189 |
| 35 | 34 | 1.2332 | 1.5979 |
| 37 | 23 | 0.6200 | 0.8970 |
| 34 | 15 | 0.3429 | 0.4097 |
| 29 | 31 | 0.8573 | 1.2133 |
| 38 | 8 | 0.2094 | 0.2094 |
| 14 | 40 | 2.1614 | 3.9258 |
| 3 | 37 | 1.4093 | 1.7987 |
| 21 | 24 | 0.6305 | 0.6305 |
| 11 | 42 | 3.1600 | 4.2537 |
| 24 | 32 | 1.0230 | 1.5933 |
| 32 | 22 | 0.5862 | 0.7219 |
| 40 | 25 | 0.6428 | 0.6995 |
| 16 | 36 | 1.3853 | 1.8202 |
| 44 | 26 | 0.6590 | 0.6590 |
| 47 | 41 | 2.2180 | 4.7161 |
| 43 | 12 | 0.3147 | 0.3147 |
| 25 | 43 | 4.7098 | 8.3521 |
| 1 | | | |

| NP | ORDER | WGR | BGR |
|---|---|---|---|
| 1 | 35 | 1.2686 | 1.6834 |
| 36 | 30 | 0.8537 | 1.0002 |
| 19 | 39 | 2.0329 | 3.1795 |
| 45 | 21 | 0.5607 | 0.5607 |
| 30 | 44 | 6.6128 | 9.5970 |
| 22 | 14 | 0.3220 | 0.3220 |
| 12 | 6 | 0.1749 | 0.2419 |
| 15 | 13 | 0.3213 | 0.4677 |
| 6 | 17 | 0.4428 | 0.6251 |
| 13 | 29 | 0.8316 | 1.6091 |
| 17 | 33 | 1.0863 | 1.3348 |
| 10 | 27 | 0.7228 | 0.8825 |
| 20 | 20 | 0.5369 | 0.7454 |
| 28 | 4 | 0.1198 | 0.1198 |
| 4 | 38 | 1.4571 | 1.9851 |
| 31 | 18 | 0.4939 | 0.6538 |
| 42 | 10 | 0.2654 | 0.2988 |
| 5 | 9 | 0.2427 | 0.3557 |
| 41 | 1 | 0.0167 | 0.0167 |
| 26 | 7 | 0.1987 | 0.1987 |
| 2 | 2 | 0.0411 | 0.0411 |
| 9 | 45 | 8.4231 | 48.2504 |
| 7 | 46 | 10.2174 | 50.5885 |
| 27 | | | |

NP = Number of province

WGR= Within group variance

BGR= Between group variance


Madrid

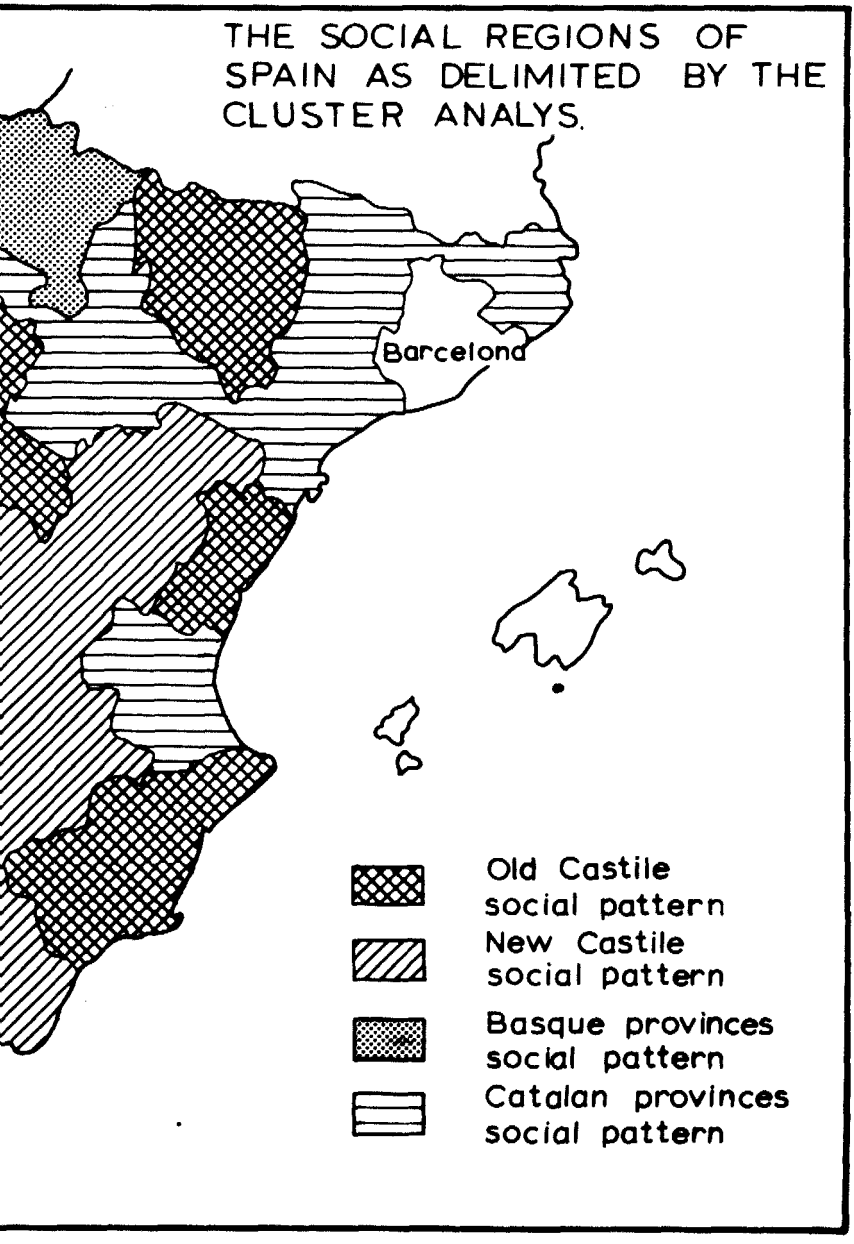

THE SOCIAL REGIONS OF SPAIN AS DELIMITED BY THE CLUSTER ANALYS.
Barcelona
Old Castile social pattern
New Castile social pattern
Basque provinces social pattern
Catalan provinces social pattern

FIGURE 4:9

Conclusions

The methods used here have provided, as near as is possible, an objective classification of the distressed or backward regions of Spain. The analysis also has provided a clear indication of the conditions most closely associated with underdevelopment in Spain. However, two warnings about methodology should be mentioned here. The results obtained are entirely dependant on the variables used, and different variables could lead to different areas being defined as underdeveloped. Secondly, the methods of factor and cluster analysis used, although the most sophisticated available to date, nevertheless have certain limitations. Future improvements to the techniques could yield results different to those obtained here.

Figures 4:5, 4:7 and 4:9 are in broad agreement in defining the southern and western provinces as constituting the most backward regions of Spain. This finding is in accordance with the results obtained in Chapter 7 using trend surface analysis of per capita income data. The factor and cluster analysis findings have a number of implications for regional planning in Spain.

The main aim of regional policy, as stated in the first National Plan, is the equalisation of per capita income throughout the provinces of Spain. If this policy is to succeed then regional development schemes will have to be almost exclusively concentrated in these backward southern and western provinces. However, in practise this concentration of effort is not being achieved. For example, of the first seven growth poles Valladolid, Burgos and Saragossa are located in the relatively prosperous north-east segment of the country, and only Corruna, Vigo, Huelva and Seville are in the underdeveloped regions.

The broad agreement between the three 'poverty' maps (Figures 4:5, 4:7 and 4:9) shows that the poorer provinces are underdeveloped not just in one sector, but frequently in all sectors of the economy. This highlights the need for remedies which will transform all aspects of society and the

economy. For example industrial development projects, such as those contained within the growth-pole scheme, by themselves will be insufficient if they have no beneficial effect on local agriculture or if they do not lead to improvements in housing or other aspects of social structure.

The almost exact co-incidence of the poorest agricultural areas with the latifundio region of Spain suggests that considerable emphasis should be given to the reform of this type of landholding system. However, in Spain....

> "reform of landholding structures has been confined to the consolidation of minifundios (where ownership is not in dispute) and has shied absolutely clear of latifundismo. The 1953 Law on Improvable Estates, which theoretically put pressure on (and even threatened with expropriation) those landlords who neglected their estates, has only once been applied..... to the estate of the Marqués de Villapanés, Sevilla, 1968". [58]

A true agrarian reform applied to the latifundio system would probably do more than any other single act of government to aid the agriculturally underdeveloped regions of Spain.

The wide gap which exists between the industrial north-east and the rest of the country will require considerable effort and resources if it is to be overcome. The failure of isolated industrial prestige projects, such as the I.N.I. based projects to influence the general industrial development of the backward regions suggests that in future industrial development will have to be a more broadly based and grass roots movement which springs from the economic advantages of the region and the initiatives of its population. In this respect the growth-pole policy would appear to be more suited to the needs of the underdeveloped industrial regions.

The factor and cluster analysis also shows that the south and west forms the most socially deprived region of Spain. The implication is that government will have to invest a great deal more in education, housing, etc., if this area is to have a level of social development equal to that enjoyed in the rest of Spain.

Finally the analysis has yielded results which are in conformity with the modernization concepts mentioned in the introduction to this chapter.

The north-eastern region of Spain, especially the Basque and Catalan provinces, have been shown to have an advanced urban and industrialized society with a flourishing agricultural sector and relatively advantageous social conditions. In contrast, the south and western regions of Spain have been shown to have more of a peasant-based society, lacking educational and social advancement and still highly dependant on traditional and antiquated forms of agriculture.

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## Chapter 5

# THE DEVELOPMENT OF THE GROWTH-POLE CONCEPT

### Introduction

Since 1955, considerable interest has been taken in the growth-pole concept. Evidence for this is seen in the large number of articles which have appeared on this topic in recent years[1]. Despite this popularity, no single group of principles has yet emerged which could claim recognition as a formal growth-pole theory, and at present it is more true to speak of groups of theorists pursuing differing aims than of any established theories.

One reason for this lack of formal theory has been the existence, in N. M. Hansen's phrase, of "semantic confusion"[2]. This is a result of the nebulous form in which most of the concepts have been stated, and which has led to a wide variety of interpretations. It has led also, to contradictory statements by different authors[3] and even within the works of a single author. However, the main reason for the lack of a consistent growth-pole theory, has been the differing objectives of the main groups of theorists. The majority of writings have emerged from two distinct traditions; one, a French school[4] which has grown up around the work of François Perroux and which has the aim of creating a complete and dynamic theory of economic development; the other an American school which has the more practical aim of finding the causes of regional backwardness and producing policies to overcome these conditions. The one point in common between these two groups has been the belief that economic growth does <u>not</u> appear everywhere simultaneously, but rather that growth naturally occurs in restricted areas or poles, that it occurs in varying intensities, and that it then spreads out to a greater or lesser extent to the surrounding areas.

In recent years the two approaches have tended to converge. Both groups are becoming preoccupied with the problems of regional planning and each has become increasingly aware of the other's work.

French Theory

The starting point for many of the French theorists has been their general dissatisfaction with the German or classical theories of location. These complaints have been listed by Bauchet[5] and others who suggest that classical theory is too divorced from reality, too reliant on transport features, and provides little or no guidance for planning and decision making. However, it could be argued that these limitations have not been overcome and are equally applicable to the French school's own theories (see below).

Any study of the French school must begin with the work of F. Perroux, for although few people to-day accept his analysis most use his wide ranging ideas as a basis for their own work.

In outline, Perroux's ideas on growth-poles, pôles de croissance, are quite simple. Within an economy at any time there are new industries emerging, selling new products. These new industries have inducement effects on other industries, causing further products to be made and sold. The original new industries are situated in those cities which are the centres for ideas and innovation, and it is these cities and industries which are the poles of growth. They are the centres for new developments within the whole economy.

From these basic ideas, Perroux built up a complex analysis. Unfortunately no single and complete account of this analysis exists. It has been elaborated in a wide variety of articles in which Perroux has constantly shifted his point of view. (His major book, L'économie du 20e siècle[6], is merely a collection of some of these articles). Perroux has created further difficulties by using loose definitions; by apparent contradictions; and in later works by openly refuting some of his earlier ideas. It is difficult, therefore, to identify the constant elements within the analysis.

Perroux's main concern has been with the creation of "nothing less than a general theory of how the capitalist economy functions and evolves"[7] - i.e. to provide a domination account of the capitalist system. Growth poles

are only a by-product of this general theory, although they are the part of his work which has been most widely discussed and accepted. However growth-pole theory should first be viewed within the framework of this general domination theory.

Domination

The domination theory attempts to provide a complete and dynamic interpretation of all economic activity. For this Perroux steps outside the mainstream of classical economic theory, which he regards as largely sterile[8], and instead uses the concepts and ideas which have been developed by Wicksell, Cassell and above all by Schumpeter.

Perroux first states that under normal conditions an economy is in static equilibrium. Under perfect competition production and consumption will be in constant balance. 'Marginal advantage obtained' will always equal 'marginal advantage foregone'[9]. This is Gustav Cassell's 'stationary circuit'[10]. Growth in the economy is due either to shocks which come from outside the system (growth in population, increase in exports, etc.) or from structural changes which occur within the system. The key to these structural changes lies in the concept of dominance.

Perroux states that in real life economic activity is dominated by powerful economic units, which do not react passively to economic change. Rather they adopt offensive strategies against competitors and against their whole economic environment. Domination is said to be present when one economic unit exercises an influence over another.

> "A ne considérer que deux unités économiques, nous dirons que A exerce un effet de domination sur B quand, abstraction faite de toute intention particulière de A, A exerce une influence determinée sur B sans que le réciproque soit vraie ou sans qu'elle le soit au même degré. Une dissymétrie ou irréversibilité de principe ou de degré est constitutif de l'effet en examen"[11]. Perroux later expanded this definition. "L'effet de domination consiste, ou le soit, en une influence irréversible ou partiellement réversible exercée par une unité sur une autre. Une unité économique exerce cet effet en raison de sa dimension, de son pouvoir de négociation, de la nature de son activité ou de son appartenance à une zone d'activité dominante"[12].

Domination may occur between all branches of economic activity, both consumption and production units; it occurs at all levels of economic

activity from the single firm, to an industry, or even a whole national economy; and may occur by means of price changes, product competition, capital movements, etc.

The process of domination is considered cumulative; once an economic unit gains an advantage over a rival because of its size, its negotiating strength, or the nature of its activity, it will tend to increase this advantage. "Dès qu'une inégalité quelconque entre firmes est admise, la brèche est ouverte par laquelle l'effet cumulatif de domination s'insinue"[13].

Perroux claims that the domination account of the economy has a wide application, that it encompasses monopoly and oligopoly activity, economic colonialism, changes in the terms of trade, etc.[14] In Perroux's theory a central role is played by large enterprises and dominating firms. These firms, although in monopolistic or semi-monopolistic situations, are seen not as obstacles to development but rather as the origin of new growth. The argument states that it is because these entrepreneurs are dominant, because they have security, that they will introduce new techniques and new products. The competition that follows will be between unequals, between the dominant and the dominated, but this unequal competition is part of the crucial process for achieving economic growth. The large firm with its new products and new techniques is able, because of its size and dominating position, to induce growth and change throughout the rest of the economy. Thus Perroux's analysis closely follows Schumpeter's argument that economic progress is dependent on innovating entrepreneurs[15], and indeed Blaug claims that it is an inferior copy of his work[16].

However Schumpeter's analysis itself is widely disputed, both in theory and in practice. Hildebrand[17] points out that just because a firm may innovate does not mean that it will innovate. Nor is it certain that economic forces will pressurize it to this end, for although a monopolist is best able to innovate he has least incentive to do so. Further, there is little evidence to suggest that all monopolists are innovators.

> "Schumpeter's thesis that during the last decade innovations have principally come from the largest firms is supported by slender evidence and, according to expert opinion, 'seriously open to question'"[18].

Perroux's analysis lies open to the same criticisms, for there is little to suggest that dominant economic units have been the only sources of economic growth. However, a more fundamental criticism of Perroux is that he provides no explanation of the domination process. That is, Perroux explains what happens, but not how it happens. Perroux claims that domination is present in a monopolistic firm or a colonising nation, but there is no explanation of how this domination works, or why certain units achieve a dominating role and others do not. There is no explanation of what motivates a dominating unit (the need for security?), or how a dominant unit behaves (does it first dominate its suppliers or its customers?), or why some dominant units lose their power and position, Without this explanatory content, Perroux's analysis can tell us nothing about the economy, indeed it calls into doubt whether it can be considered a theory at all.

Lastly Perroux's account of domination in operation add nothing to his analysis[19]. These accounts are similar to any standard work and contribute no new understanding of the subject matter or of the process of domination.

The shortcomings of Perroux's general theory of domination need not necessarily involve a rejection of the growth-pole concept. However before discussing this in detail, it is necessary to examine the second of his fundamental concepts, the concept of economic space.

Economic Space

It has been noted above that many French writers have been dissatisfied with 'classical' theories of location. For example Pierre Bauchet[20] has suggested that there has been an over-emphasis on transport factors. Perroux himself believes that 'classical' theorists have been using what he regards as a rigid concept of geo graphical space, thereby narrowly restricting the scope of their work. However for Perroux.....

"La dimension physique, en kilomètres carrés, de l'espace géographique n'importe pas, en premier approximation",[21] because a...."banal sense of space location creates the illusion of the coincidence of political space with economic and human space"[22].

In order to escape from this rigid or 'banal' concept, Perroux proposes that space should be regarded in an abstract form through the extension to.... "economic science of the notion of abstract space defined by modern mathematics and physics"[23], and this new concept of economic space....."is necessary for the radical transformation of some of our fundamental economic theories"[24]. Thus space should no longer be regarded as a series of physical locations with fixed coordinates, but rather as abstract mathematical relationships. In his analysis there are as many economic spaces as there are economic relationships, and any economic unit can be identified by a set of different economic spaces[25]. Although many different space-sets exist, Perroux proposes that they be classified into a number of space-types:

1) Geonomic space This is 'geographical' or 'banal' space, and is rejected for use in spatial economic analysis.

ii) Economic space
   a) Space, as defined by a plan.
   b) Space, as a field of forces.
   c) Space, as a homogeneous aggregate.

Planned space includes all those economic spaces which are part of organized economic activity. Perroux gives for an example the organized relationship which exists between a firm and its suppliers and customers. Economic space as a field of forces consists of a number of centres or poles from which centrifugal forces emanate, and to which centripetal forces are attracted[26]. Lastly in homogeneous space, economic units under differing conditions will be subject to equal economic forces. For example, firms in highly differing locations may be charged the same rate for the cost of electricity.

A number of important criticisms can be made of this classification of space. First, the three types of economic space lack precise definitions, and the distinctions between them are not altogether clear. Second, there

is no analysis of the relationships which exist between the three space-types. However, as most economic units are bounded by more than one form of economic space, it is vital to understand these relationships. The main limitation of Perroux's approach has been his rejection of geographic space. Although he realised the importance of viewing space in abstract terms, of not being tied to a rigid concept of space, he then proceeded further and rejected geographical space as 'banal', claiming that "economic units or activity cannot be localized"[27].

On the contrary, economic activity is located in geographical space. Firms do have fixed locations, and they are subject to the frictions of space. Distance does play an important role not only in transport costs, but also in access to markets, in access to supplies of labour, in personal contacts, in the diffusion of innovations, etc. As Lösch himself points out, geographic space plays a vital role in the pattern of economic activity.

> "If everything occurred at the same time there would be no development. If everything existed in the same place there would be no particularity. Only space makes possible the particular which then unfolds in time"[28].

To show the importance of geographic space, H. Beguin quotes the example of the Katanga copper industry[29], where the development of copper production since the beginning of the century has led to an expansion of infrastructure and a development of agriculture within the region. Similarly, the local environment has influenced activity in the copper mines, through the difficulties of communication, the poor quality of local agriculture, and the lack of large urban developments; which all have raised the costs of production and limited the exploitation of copper. In short, economic activity does have an important influence upon the geographical environment, and vice versa.

This type of analysis is not possible in the Perrouxian system. Perroux's concept of economic space is restricted to an abstract definition, and tells us nothing about the occurrence of economic activity within 'geographic' space. That is, Perroux's concept of economic space can render no explanation, no hypotheses, of real world situations.

In contrast to Perroux, Labasse[30] has pointed out that there is every need to adopt a 'geographers' or 'total' view of space. This is not to revert to a rigid 'kilometric' space, but to a fluid concept which can accommodate ideas such as time-distance or cost-distance. Ultimately, however, only geographic space can proffer hypotheses about real world situations.

H. Beguin arrives at a similar conclusion....

> "la considération des seuls espaces économiques ne suffit pas pour comprendre la totalité des facteurs qui exercent une action sur les mécanismes économiques; il n'est pas douteux que l'espace géographique les influence également. Les deux concepts d'espace sont a utiliser ensemble en vue d'une meilleure connaissance de la réalité".[31]

In short, the location of economic activity should be viewed, not in terms of economic space as in Perroux's analysis, but in terms of all the factors; whether economic, geographic, social, political, etc. which influence economic location.

Growth Poles and Propulsive Industries

Perroux defines a growth pole as the location of an economically dominant unit. This unit, working through economic space, induces growth in other economic units which may or may not be in geographical proximity. Perroux frequently used the term 'unité motrice', or 'propulsive unit', for such dominating units.... "un pôle de croissance est une unité motrice dans un milieu déterminé".[32] The 'unité motrice' could be simple or complex, a single firm, an industrial grouping, a public corporation, etc.[33]

The concept of the growth pole implies more than the point at which growth industries are located, it includes the notion of a field of economic forces which emanate from the pole. These forces are transmitted through economic space, and may have repercussions throughout the whole economy, including the local economy. In his original statement, Perroux certainly contemplated the growth pole as influencing the immediate geographical area.

> "Le pôle industriel complexe, géographiquement agglomeré, modifie son environnement géographique immédiat et, s'il est puissant, l'entière structure de l'économie nationale où il est situé".[34]

In his later writings he concentrated solely on the effects within abstract economic space, and not at all on the local geographic effects.

Although propulsive units play a fundamental role in French growth-pole theory, unfortunately they lack clear or useful definitions. Perroux himself gives an ex post definition, that a unit can only be considered propulsive after it has been seen to influence other units.

> "Une unité.... est motrice quand elle exerce sur d'autres unités avec qui elle est en relations, des effets d'entraînements".[35] Also.... "L'unité est motrice dans un espace économique et social determiné quand le résultante de tous les efforts qu'elle engendre est positive, en ce sens qu'elle change les structures de façon telle que le produit réel global et net de l'ensemble connaît un taux de croissance plus élevé".[36]

Davin reaches a similar definition: a propulsive industry....

> "constitue finalement un pôle de croissance quand, par les flux de produits et de revenus qui en dérivent, elle conditionne le développement et la croissance d'activités en laison.... avec elle".[37]

However these definitions do not say why industries are propulsive. There is no explanation of the processes of industrial growth, there is no possibility of recognising the propulsive industries of the future, and nothing has been added to the principles of planning policy.

Perroux recognised a type of propulsive industry, which he termed a key industry ('industrie-clef'), which induces growth throughout an entire industrial grouping, or even the whole economy.

> "La propriété examinée existe à des degrés variables d'industrie motrice à industrie motrice: appelons industrie-clef qui induit dans la totalité d'une ensemble, par exemple d'une économie nationale, un accroissement du débit global beaucoup plus grand que l'accroissement de son propre débit". [38]

Perroux suggests that industries such as transport[39], energy, and the producers of raw materials, are well placed to become key industries. However, he stressed[40] that the term 'key industry' is relative and that it has only one essential feature, a decisive ability to promote growth. This definition is also ex post. Key industries can only be identified after they become strong economic forces.

In his later writings Perroux avoided use of the term 'clef', claiming that it had a fixed definition, containing nothing more than what was

included in the definition. "Nous n'avons pas prononcé une seule fois le terme d'industrie clé. Cette terminologie ne nous paraît pas heureuse".[41] He further claimed that it was no use trying to list key industries or describe the criteria by which they could be recognised.[42]

Other French and Belgian theorists have not accepted all of Perroux's definitions. For example, whereas Davin is generally in agreement with Perroux....

> "L'idée de pôle de croissance se précise, en effet par celle d'industrie motrice et industrie clef, dont le pouvoir d'induction économique est l'un des traits essentiels",[43]

Paelinck states quite the contrary, that development poles should not be confused with notions of key industry, basic industry and industrial ensembles[44].

To cut through this confusion, it is proposed to list the characteristics which, by common concensus are basic to a propulsive industry.

1) The firm must be large in order that it shall have a significant influence on the economy.... "le grande firme se présente comme un moteur des progrès économiques".[45] Similarly Bauchet[46] has suggested that the mass of a large firm alone is capable of starting a region on the path to economic growth. Also it has been accepted in much of the literature that the propulsive firm should be capital intensive and that it is often found in heavy, siderurgical and metallurgical industries. (The so-called 'Stalin' industries. See Perroux's study of the Ruhr and Boudeville on the Minas Gerais[47]). Unfortunately little attempt has been made to define 'largeness' in a firm. Perroux suggests that a 'grande firme' has 60% of the total production of an industry;[48] however he does not pursue this point and a 'grande firme' does not necessarily imply a large firm.

ii) The propulsive industry must be relatively fast growing. Perroux suggests that growth of production is most likely to raise productivity and thereby reinforce the industry's dominant situation.[49] According to Perroux the growth industries commonly include the electrical industries, transport industries (especially cars) and mechanical engineering, although he gives no reasons for this choice[50].

iii) It is widely stated that a propulsive industry is the centre of innovation. Perroux also recognised the importance of institutional frameworks within which new ideas are generated (research institutes, etc.) and are propagated (agricultural societies, government information offices, etc.)[51]. For Lasuén, it is this innovation process which is crucial for growth poles, rather than their size or their ability to induce growth through multiplier effects[52].

iv) Implicit in most studies is the belief that a propulsive firm will be in a monopolistic or oligopolistic situation. This follows from the Schumpeterian approach to economic dominance, (above)[53]. Perroux also believes that monopolistic firms or oligopolistic groups of firms are well equipped to establish new ideas and methods.

> "Joignons que les industries examinées sont, le plus souvent, en regime d'oligopoles et de groupes ; une fraction au moins des oligopoles et des groupes dans les économies les plus développées accomplit un effort intense de recherche et d'innovation;....."[54].

The monopolistic factor is strongly represented in Perroux's concepts of 'key industry' and 'grande firme'.

v) The fifth generally accepted feature of a propulsive industry is that it is able to induce strong economic growth in other parts of the economy.

Inducement Effects

In his first statement on growth-poles Perroux[55] claimed that it was possible to measure inducement effects by using Scitovsky's[56] concept of external economies where expansion in industry A may also give rise to profits:-

a) in an industry that produces a factor used in industry A.

b) in an industry whose product is complementary in use to the product of industry A.

c) in an industry whose product is an substitute for a factor used in industry A.

d) in an industry whose product is consumed by persons whose incomes are raised by the expansion of industry A.

Similarly Perroux believed that it was possible to measure the effects of a propulsive industry upon the whole economy[57], and the impact of an

industrial complex upon another industrial complex[58]. However there are considerable practical difficulties in measuring these effects and Perroux gives no indication of how this may be achieved.

Inducement Effects

Several authors (Paelinck[59], Davin[60], Körner[61]) have recognised four main inducement effects which they have termed: tehnical, income or revenue, psychological and geographical. Technical inducements either occur through investment in infrastructure, e.g. an improvement in communications which is of benefit to all industry in an area, or through growth induced in firms technically linked to the propulsive industry, e.g. the links between the siderurgical and chemical industries. Income inducements are essentially income multiplier effects,whereby the propulsive industry raises the general level of income in the region or industry. Psychological inducements are variously described, but include intangibles ranging from 'a business-like atmosphere' to more conscious attempts at propaganda extoling a region's or an industry's virtues. Lastly geographical polarisation includes inducements which benefit the local region. However these definitions are vague, and except for the income multiplier effects, impossible to measure.

In 1960 an original contribution was made by H. Aujac[62] who formalised Perroux's domination effect on the basis of sales. Aujac began with Perroux's 1948[63] definitions of two principal domination effects, one due to differences in bargaining power, the other to differences in size[64]. An industry j will dominate an industry i, if it is in the position of 'meilleur client'. Thus j will dominate i if the total sales from i to j are greater than the total sales from j to i. Similarly j will dominate i when sales from i to j form a larger proportion of i's total sales, than sales from j to i form of j's total sales. Formally stated[65], the domination effect measured by sales is:-

$$\left(Aij/Pi\right) > \left(Aji/Pj\right)$$

- where Aij represents sales from industry i to industry j, and Aji the converse - and where Pi and Pj are respectively the total sales of i and j, - then industry j is said to dominate industry i.

This analysis was extended by the use of input-output tables. Triangulation of the matrix is based on 'meilleures clientes' with strong demands (domination) situated below the diagonal, and weak demands above it. From the matrix it is possible to build up a hierarchy of dominant industries.

The hierarchy which Aujac established for France is as follows, in descending order of dominance:-

- construction and public works
- various services
- agriculture and food industries
- agriculture
- mechanical and electrical engineering
- textiles and leather
- wood, paper and furniture
- diverse industries (unspecified)
- chemicals
- siderurgical
- non-ferrous metals
- transport and communications
- energy
- rubber
- renting and hire purchase

This is a very simple form of reasoning with many weaknesses (see below), nevertheless it does suggest possible economic policies. For example it is suggested that a good way to improve economic growth would be to support the agricultural sector. However this should not be seen as a universal panacea, for as Boudeville[66] points out the situation in India and Brazil is exactly the opposite, where it would be better to support industry.

This new approach was taken up by many authors, notably the Belgian economists L. E. Davin, J. Waelbraeck, and J. Paelinck, and also by F. Perroux himself, but who later showed himself to be aware of the

method's limitations[67]. Input-output studies have promoted detailed analyses of the effects generated by propulsive industries. The most extensive account is given by Paelinck[68], who distinguishes between static and dynamic benefits.

Amongst the static benefits Paelinck lists are:-

i) Leontief-Rasmussen effect, a short-term multiplier matrix effect.

ii) Perroux effect, medium-term structural changes involving production increases.

iii) Keynes effect, the classic consumption-savings multiplier.

iv) Scitovsky effect, medium-term price effects resulting from changes in production.

v) Capet effect, the effect of regional leakages.

and amongst the dynamic effects:-

i) Aftalion effect, a feed-back effect based on the accelerator.

ii) Matilla effect, an effect of association.

iii) Paelinck effect, a polarisation effect which can be either progressive or regressive.

However as several authors soon realised, the use of input-output techniques was creating more problems than it was solving and tending to lead the argument away from central issues. The first limitation, as Lasuén[69] points out, has been the considerable lack of sophistication in the use of this analysis. Old and unreliable techniques have been used. However, even with improved techniques seemingly insuperable difficulties remain. In a survey of regional input-output techniques Tiebout[70] points out two major limitations, the lack of suitable data and the need to make vast simplifying assumptions to make the models operational such as the neglect of price effects, the oversimplification of industrial categories, or the assumption of linear production functions. For growth-pole theory the main limitation of input-output analysis is that it can only show the structure of dominance, it cannot explain the process of domination. Tiebout's review ends with a very pessimistic conclusion....

> "It may be that further work in this area will eliminate some of the problems raised above. Note, however, that this is not necessarily a call for further research in this area. --- Before such a call is put forth on behalf of regional input-output research, alternative methods of attacking similar issues should be appraised".[71]

Following Tiebout, it is proposed to concentrate attention on other aspects of growth-pole analysis[72].

The Attempts at a Revision of Perroux's Growth-Pole Theory

Several attempts have been made to overcome the limitations of Perroux's analysis. In part these attempts have been stimulated by the ideas of foreign, and in particular American, authors and has lead to a narrowing of the gap between the French and American theorists.

i) Prost

M. A. Prost[73] believes that growth-pole theory can be improved by extending the concept of economic domination. Prost[74] is in broad agreement with Perroux's description of the dominant economy and the dominant firm (above). He agrees that domination is felt through abstract rather than geographic space, that domination is cumulative, and that dominant and propulsive industries form growth poles of the cities within which they are located. To this Prost[75] would add the sociological theory of dominance of Gras, Mckenzie and Vance and Smith[76], which states that in the modern world the dominant economic and social form of organisation is the 'metropolitan economy'. Through the operation of markets, the location of industry and through being the centre of transport networks, the metropolis organises and integrates economic and social life throughout a large surrounding area. Once established as a regional centre the city becomes the most favoured location for new industries, and for new intellectual technical and creative activities. It is this cumulative process which causes the rapid growth of many towns. Prost believes that the 'polarisation effect' of Perroux is one of the main reasons for this urban domination[77]. Despite this, Prost's main conclusion is that new techniques devised by American writers should be used to analyse urban domination[78].

ii) Lasuén

J. R. Lasuén's work[79] challenges some of Prost's conclusions. Lasuén claims that cities have not observed sudden bursts of growth and decay; indeed if any pattern is discernable it is that city growth is becoming

more stable[80].

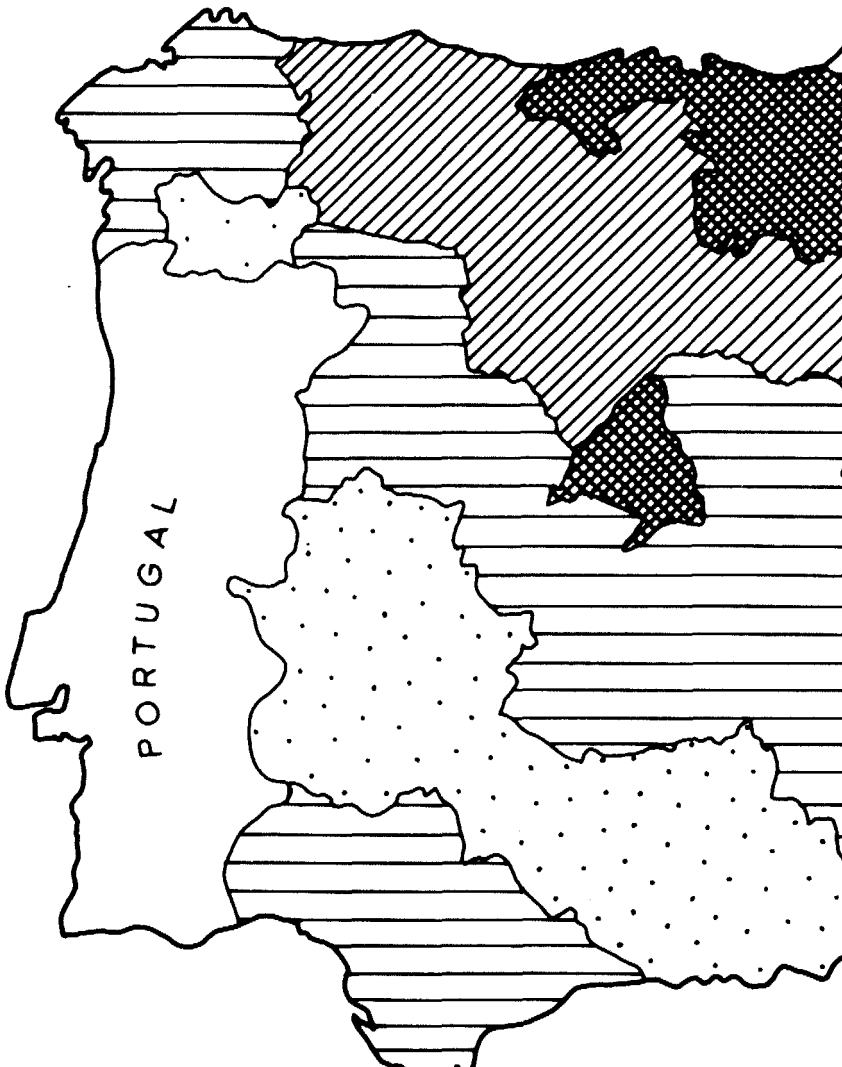
As an alternative analysis, Lasuén suggests that innovations are the prime movers of economic development. Although mentioned by Perroux in his 1955 paper,[81] study of the role of innovations in growth-pole theory has been neglected since then. According to Lasuén[82] economic development is the process of firms adopting new ideas and is usually done by those manufacturers who make a product being replaced or improved, or who make components or other related products. The rate of innovation discovery is occurring ever more rapidly and modern industries are highly adaptive to new ideas. Nevertheless the rate of economic and urban growth has become more stable and this is due to the modern structure of firms as looseholdings of multi-plants making multi-products. Lasuén[83] compares the monolithic and 'nineteenth century' firm of Krupp with the modern and flexible Litton industries. Lasuén suggests that because of the diffuse nature of modern industries with factories in a wide number of locations, development is less geographically polarised than in the past.

As a result of this argument, Lasuén suggests that regional planning strategy should include the re-organisation of business into multi-product, multi-plant firms, as well as the encouragement of industrial re-location in backward areas.

iii) Boudeville

J. R. Boudeville's[84] approach has closely followed Perroux's original ideas, but his contribution has been to investigate the impact of a growth-pole throughout 'geographic' space, in comparison to Perroux's concentration on 'abstract' space. It is an attempt to construct a more concrete analysis around Perroux's largely theoretical ideas.

Boudeville starts by accepting Perroux's division of space into three types; homogeneous, polarized and planned[85]. A homogeneous region consists of a group of units having the greatest possible number of uniform characteristics, and possibly bounded by the constraint of contiguity. A good example is shown in Figure 5:1 of net production per capita in Spain for 1964. This shows Spain divided into homogeneous regions, with provinces




Source: Banco de Bilbao 1967

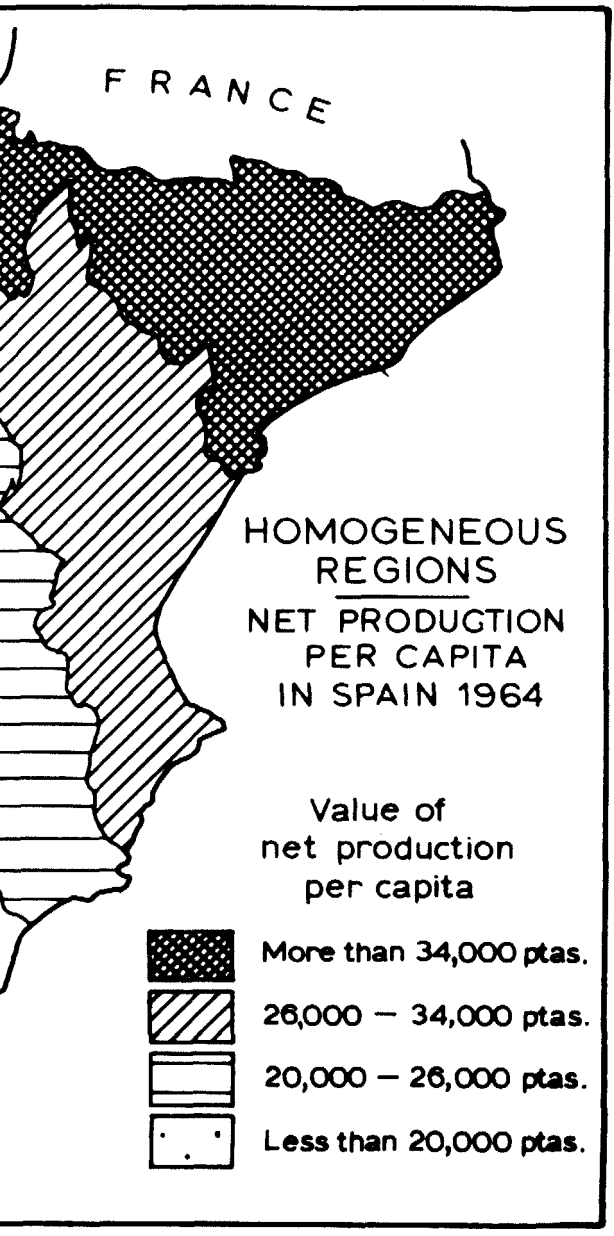

FRANCE
HOMOGENEOUS REGIONS
NET PRODUCTION PER CAPITA IN SPAIN 1964
Value of net production per capita
More than 34,000 ptas.
26,000 — 34,000 ptas.
20,000 — 26,000 ptas.
Less than 20,000 ptas.

FIGURE 5:1

of the same income values contiguous to each other, with the exceptions of Orense, one of the poorest provinces and Madrid, one of the richest.

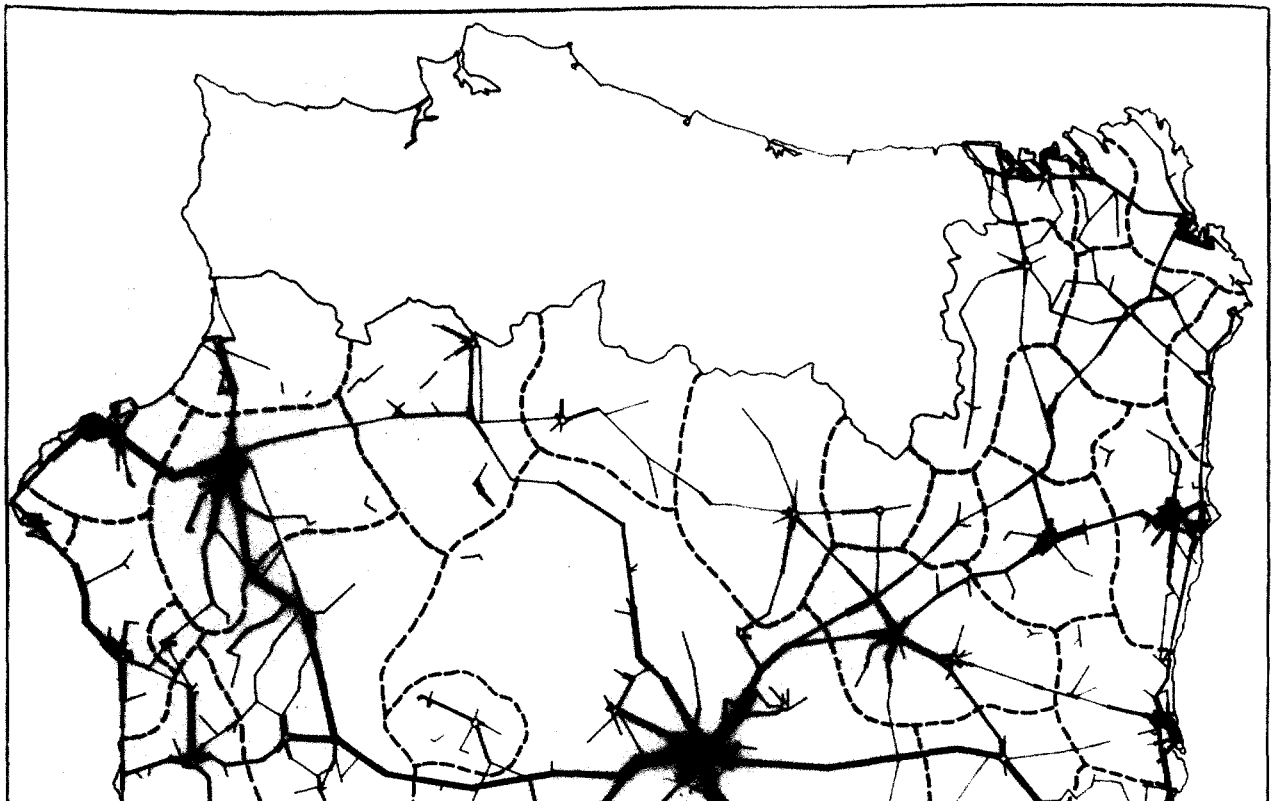
Polarized space is heterogeneous, its various parts are complementary, and there exists a strong interchange between the dominant city, or pole, and the surrounding region. Clearly in polarized regions, the notion of exchange is important. A second feature is that polarized regions occur in hierarchies corresponding to the specialized goods and services that the pole produces.

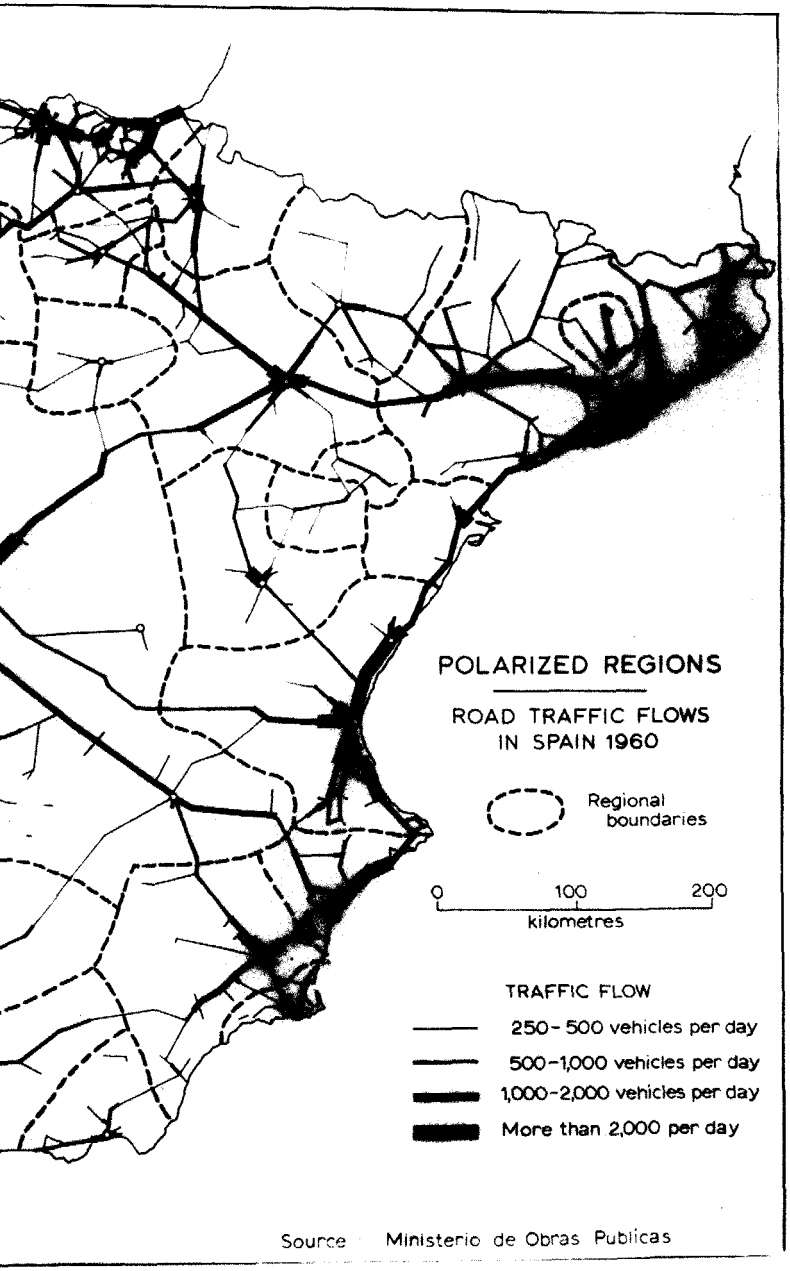
> "A polarized region has been defined as the set of neighbouring towns exchanging more with the regional metropolis than with other cities of the same order in the nation".[86]

Figure 5:2 shows polarized regions in Spain based on road traffic flows.

An important part of Boudeville's analysis has been concerned with establishing the boundaries of a polarized region. Boudeville has described a number of methods. His first suggestion was to plot the limits of the movement of goods or services as shown by newspaper circulation, commuter catchment area, movement of goods, etc. However, Boudeville readily concedes that there would be as many boundaries as goods involved, and these would have to be combined to form a most general trading area. A second suggestion has been to use flow diagrams and graph analysis, based on road traffic or telephone call data. However, Boudeville makes no mention of the considerable problems involved in obtaining such data and in its evaluation. Is one car equal to one lorry in assessing traffic flow, or a social equal to a business telephone call? The last suggestion is to use gravitational analysis based on the Reilly formula and modified by population changes. Boudeville makes no mention of possible improvements to the Reilly model, - e.g. by 'weighting' the population by a wealth index.

The regional metropolis will extend its influence through the creation, enlargement and annexation of satellite towns, and by generally controlling the wealth of the surrounding area. A study of boundary movements will indicate the changing importance of regional growth poles. Although not mentioned, Boudeville clearly implies the concept of






Source Ministerio de Obras Publicas

FIGURE 5:2

metropolitan dominance. (See below).

The planning region is an amalgam of the other two types of region, with its size and boundaries dependent on the purpose for which it was established, e.g. regional planning, local government administration, etc. (See Figure 5:3 for the provincial boundaries in Spain. These were established in the early nineteenth century as the basic administrative framework[87] in Spain).

In general, little of Boudeville's analysis of regions is particularly new or revealing. The concept of the homogeneous region is no different from the 'uniform' region of De la Blache, Herbertson[88], etc. formed at the beginning of this century. Similarly the concept of polarized regions was anticipated many years before by Galpin, Gras, Whittlesey, etc.[89] Boudeville's work on boundaries indicates little of the complexities involved in such studies[90]. The work on a graph theory analysis of polarized regions has been further developed, by Nystuen and Dacey[91], Garrison[92], etc. Lastly, Boudeville's analysis has not benefitted from modern developments such as the use of general field theory, factor analysis, etc.[93]

Boudeville also discussed the industrial structure of growth poles and his analysis partly bridges the gap between the American and French theorists. Boudeville defines a regional growth pole as a....."set of expanding industries located in an urban area and inducing further development of economic activity throughout its zone of influence".[94] 'Propulsive' industries are defined as those having the greatest direct or indirect influence throughout a region,[95] i.e. they have a geographical impact, whereas 'key' industries have the greatest influence within the industrial sector,[96] i.e. they have a sectorial impact. A dominant industry exerts an assymetrical and irreversible influence over other industries and can be defined by use of Aujac's 'best customer' criteria (above)[97]. Boudeville claims that a dominant industry is similar to, but not the same as, a key industry and a propulsive industry.

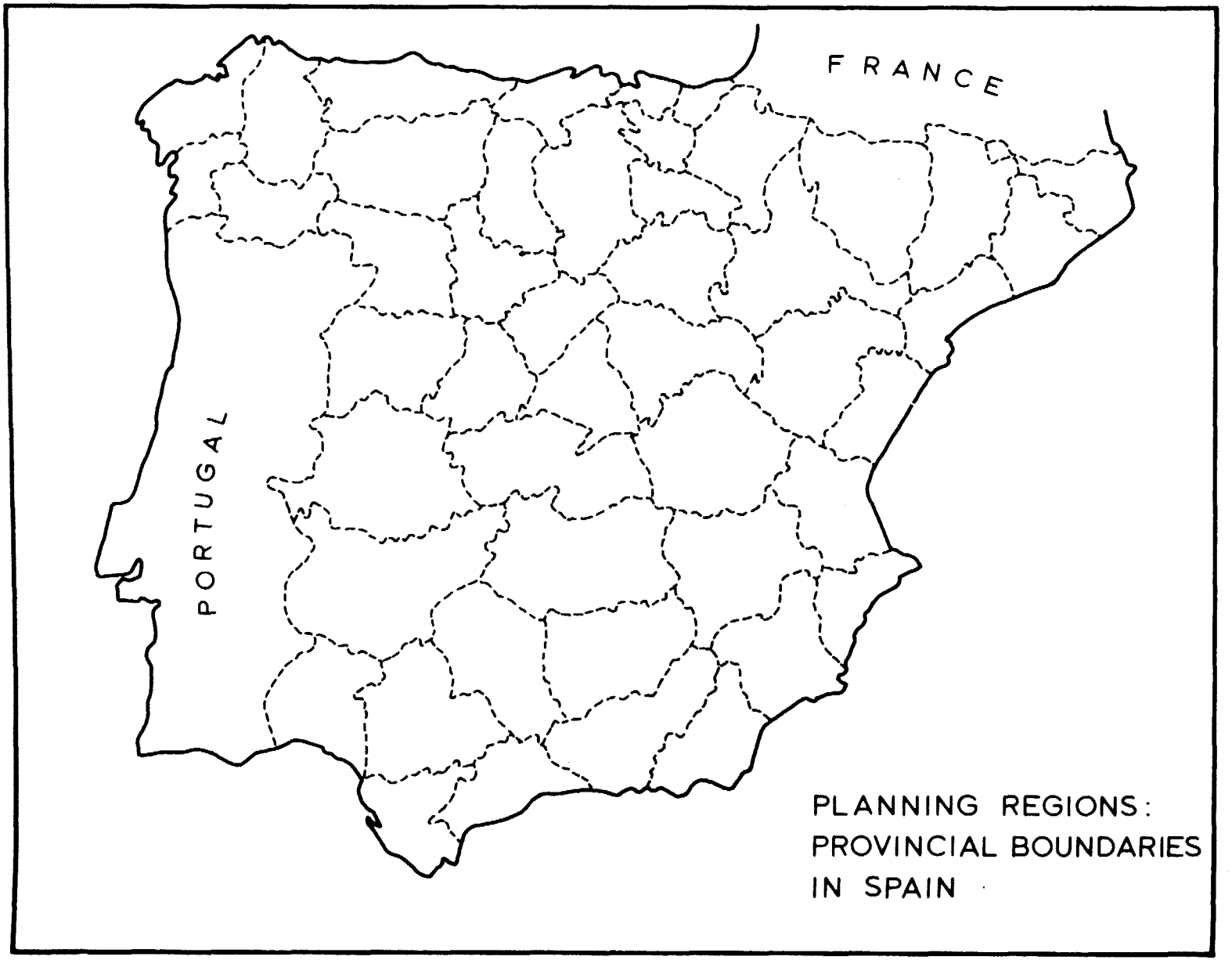

FRANCE
PORTUGAL
PLANNING REGIONS:
PROVINCIAL BOUNDARIES
IN SPAIN

FIGURE 5:3

Boudeville states that the propulsive industry will influence regional growth in two ways: i) through the multiplier effect, ii) through the creation of new activities. The multiplier effect, it is claimed, can be measured through use of an input-output matrix. The new activities will be created through the existence of 'Hirschman' linkages, either backwards to the inputs, forwards to the products, or laterally via the factors of production. Boudeville's linkage analysis closely follows Hirschman's (see below).[98]

Despite the criticisms noted above, Boudeville's contribution represents a welcome attempt to put a clearer and more concrete construction on some of Perroux's abstract ideas.

Growth Axis

Growth-pole studies have also given attention to the related concept of the growth axis. This has been mentioned by many authors, e.g. Perroux[99], Davin[100], Boudeville[101] and Aydalot[102], but the most detailed account is contained in Pottier[103].

Pottier starts from the premise that economic development does not occur equally everywhere. Some areas have economic or geographic advantages which favour growth, and these advantages are likely to be reinforced as new developments occur. This will result in decreased costs and increased profits in the favoured areas. The second premise is that routeways are not ubiquitous. (Pottier claims that in 'classical' theories of location transport is assumed to be ubiquitous. This is not strictly true[104]). Thus the existence of a transport routeway will lead to certain 'rentes de situation' or cost advantages. Pottier lists three major initial advantages:

i) Impulsion due to the creation of a new infrastructure i.e. The vast public works and major companies created to carry out these works.

ii) Impulsion due to lowering of transport costs i.e. lower transport costs and increased market areas.

iii) Impulsion due to the requirements of traffic passing along the route i.e. freight terminals, warehousing, hotels, etc.

Once a communication axis has been established it becomes a 'vector

for the propagation of development', and other advantages accrue:

i) Encouragement of the general concentration of activity along the axis.

ii) The axis will attract other general propulsive activities not dependent on the initial cost advantages.

iii) There will be a growth of population along the axis.

iv) There will be a growth of markets along the axis.

v) There will be an intensification of agriculture along the axis.

This will all lead to a cumulative process of expansion along the axis.

Pottier probably overemphasises the importance of routeways and their ability to confer continuous economic benefits along their axes. Pottier also ignores other and more rigorous analyses of the impact of a highway on general human activity, which have been conducted elsewhere[105].

Metropole d'Equilibre

A second related concept which has arisen from growth-pole analysis is the 'metropole d'equilibre'[106], or counter balancing metropolis. This concept is being put into practice during the French Vth Plan, and is an amalgam of growth-pole ideas and the concept of 'aménagement du territoire'[107].

In France the excessive size and growth of Paris has caused a general imbalance within the nation. In order to limit and contain this growth it has been thought necessary to create powerful regional centres large enough to counterbalance the drift to Paris. It is expected that growth of these regional centres will be sustained by the economic flows of capital, manpower, resources, etc. which formerly moved from the regions to Paris, and will now flow into these regional centres[108]. In France eight regional centres have been designated. It is proposed that many fiscal, social, health and other administrative functions, should be transferred to them so that they can play a larger role in directing the economic and social life of their regions.

Conclusions

Many aspects of French growth-pole theory are unsatisfactory. Many of the concepts are inadequately expressed and it is difficult to obtain

clearly defined behavioural hypotheses which are capable of being tested. The existence of 'semantic confusion' has been shown by Hansen to have led to misunderstanding and even contradiction. Before any real advance can be made, there is a need to replace this confusion with clear ideas and concepts.

French growth-pole analysis has also proved unsatisfactory in application. For example the establishment of a 'propulsive' industry has not always led to the development of a growth pole. In Lorraine the iron and steel industry has many 'propulsive' characteristics: large size, in an oligopolistic situation, and creates external economies, nevertheless it has not led to a local diversified economy. Some reasons for this have been listed by Martin[109] and include: the failure to develop the region's own coalfield, the failure until recently to canalize the Moselle, the failure until recently to lower the artificially high international freight rates, the proximity to hostile frontiers, and the late technical advance in the use of coking coal. "Had it been able in the nineteenth century, as now, to supply acceptable coking coal, the region might today be a centre of diverse heavy industry"[110]. A second example is the natural gas industry at Lacq. This has been described as an established growth-point[111].

> "Le complexe de Lacq répond, en effet, parfaitment bien à la définition que F. Perroux a donnée des industries motrices (effets asymétriques, taux de croissance supérieur à la moyenne nationale)".[112]

Nevertheless as Aydalot points out, Lacq has only had a minimal impact on the local economy. In the Lacq region the existing industrial activities are based on agriculture, and there is no possibility of their benefitting from the natural gas. The possibilities of attracting new industries to Lacq are also small. Aydalot states that 82% of the gas is used as energy and only 18% for chemicals[113]. Thus the emphasis would have to be on attracting large energy consumers. However, Aydalot also shows that the percentage of total costs spent on energy for such industries is quite small, e.g. 16.3% for aluminium, 14.7% for the siderurgical industry, 10% for glass, etc.[114] Thus other factors, such as proximity to markets, to raw materials etc., are likely to prove dominant in influencing location. In general,

the existence of large external economies elsewhere make it likely that in the future the gas will continue to be taken to the consumer, rather than the consumer coming to Lacq.

## The American Contribution to Growth-Pole Theory

The American contribution to growth-pole theory is derived from two main sources; the attempts to construct new theories of economic development and the sociological theories of urban dominance. J.Friedmann has combined these two contributions into a more formal growth-pole theory based on the concept of modernization.

## Theories of Economic Development

### i) Prebisch

During the 1950's the difficulties encountered in promoting growth in less developed parts of the world, especially Latin America, led to new approaches towards theories of development. One of the first attempts was made by R. Prebisch, who proposed the existence of a 'centre-periphery' pattern of development[115]. Prebisch claims that historically the spread of progress has been uneven[116] and that countries are either at the centre and are wealthy and industrialized or, they are at the periphery and are poor, stagnating, and over-reliant on agriculture. Thus Meier and Baldwin claim that during the nineteenth century, the United Kingdom was in the centre, and the rest of the world in the periphery[117].

It is suggested that technological progress originates in the centre, leading to increased productivity, increased savings and high growth rates. This progress slowly spreads to the periphery, where there is a vicious circle of low productivity, a low level of savings and a lack of growth.

Assessments of Prebisch's centre-periphery model have concentrated on the terms of trade question. This states that following Engel's Law, there will be a lower elasticity of demand for goods produced at the periphery than at the centre. Although the evidence is not conclusive, most authors agree with Prebisch's conclusions[118]. The rest of Prebisch's analysis has not been seriously challenged and is accepted by many writers.

One omission from Prebisch's work is that there is no application of the centre-periphery concept to conditions existing within countries. A number of surveys have shown that the differences between the rich areas and the poor within a country can be more important than the differences which occur between countries[119]. The evidence also suggests that the poorer the country the larger these within-nation differences are[120].

ii) Myrdal and Hirschman

Myrdal states that 'classical' economic theory is unable to account for these regional differences, because it is based on the unrealistic assumption of 'static equilibrium'[121]. This implies that every disturbance provokes an equal reaction within the system, which restores a new state of equilibrium. On the contrary, Myrdal claims that in underdeveloped regions there is a 'vicious circle', a circular and cumulative process continuously pressing levels downwards[122]. Cumulative causation occurs both through economic factors, such as the movement of capital, labour, and trade advantages, and through non-economic factors such as the levels of education, health and welfare[123]. Under these conditions, growth of the underdeveloped region is very slow.

Whereas centre-periphery analysis has been concerned with economic imbalance occurring between nations, and cumulative causation with imbalance within nations, the theories of balanced and unbalanced growth have emphasised the imbalance which occurs between economic sectors. Balanced growth theorists, Rosenstein-Rodan[124] and R. Nurske[125] have highlighted inadequate markets as the main bottleneck to industrial and economic growth. They suggest that combinations of investments are more likely to be profitable than individual schemes, and so a massive balanced inflow of capital is required. This has been called the 'big-push' theory. Similarly A. Lewis[126] and T. Scitovsky[127] state that once growth has been started, it can be accelerated by balanced investment.

Conversely, Hirschman argues that the lack of capital and lack of local markets have been overemphasized as obstacles to economic development,[128] and that balanced growth in the sense of simultaneous multiple

developments is beyond the capacity of most underdeveloped countries. There is a need therefore, to induce growth processes by a ..."chain of unbalanced growth sequences."[129] Similarly Streeten states that unbalanced growth will lead to pressures and incentives that yield higher rates of growth[130]. Under the unbalanced growth theory, the main problem is to find the strategic places where imbalances should be created and which will yield this growth sequence.

Some authors have suggested that the differences between the balanced and unbalanced growth theories may not be very great and not necessarily incompatible[131]. However, statistical evidence seems to uphold the doctrine of imbalanced growth[132].

Several authors[133] have identified the existence of dual societies and dual economies. Within one nation there may be two distinct societies, one rich and based on industrial and tertiary employment, the other poor and dependent on agriculture. Originally formulated by J. H. Hoeke as an explanation of conditions in Indonesia, dualism has been identified in many countries, e.g. north and south Italy. Social dualism is the result of economic dualism, and is the social aspect of the imbalance which exists geographically and sectorially within an economy. Dualism is therefore another aspect of regional imbalance as discussed above.

The most fruitful contributions of development theory to growth-pole analysis have been the accounts by Myrdal and Hirschman of the regional transmission of economic growth. Although writing from different perspectives, these accounts are remarkably similar. Hirschman states that growth first appears in a few restricted areas and that 'economies of location' or 'economies of agglomeration' will lead to further development of these early growth areas. Thus geographical imbalance is an inevitable consequence of economic growth. This imbalance will persist as investors mop up investment opportunities around the growth poles, before tackling the lesser known possibilities in the backward regions. Hirschman states that eventually there will be a 'trickling down' of wealth from the growth poles to the backward regions[134] by:-

i) the advanced region increasing its purchases in the backward region

ii) the advanced region increasing its investments in the backward region

iii) the advanced region absorbing some of the unemployed and so raising productivity in the backward region.

Hirschman states that these trickling-down effects will be strong when the economies of the two regions are complementary and weak when the advanced region is self-sufficient.

There will also be a counter-flow of economic wealth from the backward regions to the growth poles. These, Hirschman calls 'polarization' effects:-

i) being comparitively inefficient, economic activities in the backward regions may become depressed as a result of competition from the advanced areas

ii) the backward region may have to buy expensive goods from the advanced regions where before it bought cheap imports

iii) migration from the backward regions is selective taking the young, educated and vigorous, and leaving behind an elderly, tradition-bound society.

Despite the strength of these polarization flows, Hirschman believes that the trickling-down effects will eventually predominate.

Myrdal believes that the cumulative imbalance of growth causes advanced and backward regions to appear. As in Hirschman's system, growth is transmitted from the advanced to the backward regions by what Myrdal calls 'spread effects'[135]:-

i) the region around a nodal centre benefitting from the growing market for its agricultural goods

ii) the region around a nodal centre benefitting from the diffusion of technological progress

iii) the region around a nodal centre benefitting from the increased production of raw materials for consumption by industries in the advanced centres.

There will also be a flow of economic wealth from the backward to the advanced regions. These Myrdal termed the 'backwash effects';[136] they are the equivalent of Hirschman's polarization effects:-

i) migration is selective, leaving the backward regions with an unfavourable age distribution

ii) capital will flow from the backward regions, where there are few prospects for investment, to the prosperous regions where investment opportunities are large

iii) industries in advanced areas work to increasing returns to scale and successfully compete with industries in the backward regions

iv) non-economic factors also work against the backward regions. Less money is spent on health, education, etc. and society is more tradition-bound.

Although many writers have treated these two accounts as identical, there are important differences and Hirschman himself notes several of them. Hirschman considers that Myrdal's outlook is too pessimistic. He claims that Myrdal fails to see that growth poles and growth regions emerge as inevitable features of economic growth. Myrdal sees cumulative causation as the sole growth mechanism, whereas Hirschman considers that forces emerge to narrow the gap between the rich and poor regions. Lastly, Hirschman believes that Myrdal's picture of the international transmission of growth is over-pessimistic.

However there is one more important distinction, not noted by Hirschman. Whereas Hirschman's polarization effects are similar to Myrdal's backwash effects, the trickling-down effects are quite different from the spread effects. Myrdal sees growth spreading from the advanced nodal centre to the surrounding region, whereas Hirschman sees growth being transmitted between different regions.

Theories of Metropolitan Dominance

It has been widely recognised that cities play an important role in the development of modern economies. For example, Lampard[137] has shown that there are a number of factors, such as specialization of function, external economies, service activities, etc. which link together urbanization, industrialization and economic development both in the U.K. and in the U.S.A. Similarly Hoselitz[138] and Davis and Holden[139] have shown that cities and industry are closely linked with levels of economic development in underdeveloped countries. Schnore[140] has shown that a simple identification of urbanization and industrialization is inadequate

because both factors are closely related to many others such as improvements in communications, expansion of energy consumption, etc. Schnore therefore suggests that both industrialization and urbanization form part of a more general phenomenon which he terms 'modernization'. Roberts and McBee[141] show that in Mexico, economic development is related to the level of modernization. (See Chapter 4 above).

The role of the city in local economic development has been outlined in the domination theories of Gras, McKenzie and Bogue.

Gras

Gras[142] states that at each major stage of technological development, man has devised a suitable form of community organisation. Gras recognises five such periods:- a) the collecting economy, b) the cultural nomadic economy, c) the settled village economy, d) the town economy, e) the metropolitan economy. At each of these five stages, technology has progressively released man from dependence on the local area, in exchange for increasing dependence on more complex systems of production and exchange over increasingly wider areas. This has involved increased specialization and division of labour and larger combinations of population and resources.

At the present time it is the metropolis which is at the centre of the organization of the economy and the community. The metropolis is the main producer of manufactured goods and services and acts as the centre for the exchange of these goods with those produced in the surrounding region. The crucial role of large cities in organizing and integrating the economy occurs in four phases:-

i) through the markets

ii) through industrial development

iii) through the development of transportation

iv) through financial developments

Gras warns against over-emphasising the role of the metropolitan centre. A dominating city does not cause the demise of existing smaller towns and villages. These will remain, although in a subordinate role to the metropolis. The metropolitan centre is as dependent on its surrounding

region as vice versa, for an essential element in the growth of a city is the possession of a tributary area rich in natural resources with a productive population and which is easily accessible. Thus for Gras, dominance is essentially a symbiotic relationship. "Inter-dependence of parts is really the key to the whole thing".[143]

McKenzie

Like Gras, McKenzie recognized the importance of the metropolis in the modern economy[144]. McKenzie states[145] that the organization of modern transport and communications systems has increased the inter-dependence between the city and its surrounding region. The larger the population of the metropolis, the greater its competitive advantage and the larger its local market. The growth of the metropolis and its region represents a tendency towards greater specialization and division of labour. The original cause of metropolitan growth is not so much industrial development as the tertiary activities, especially distribution and finance.

> "Once a centre becomes established as a regional distributing centre, its banking, transportation and other facilities compel new concerns to select it for their point of operation. This cumulative process is one of the chief factors in explaining the recent rapid growth of many .... cities".[146]

Basically McKenzie has used an ecological approach to analyse social organization. Modern methods of transport and production have enabled the metropolis to dominate their surrounding regions. Outlying communities are both subordinated to and integrated with the metropolis. This is the modern form of social organization[147].

Bogue

Although starting from different viewpoints; Gras an economic historian, McKenzie an 'ecological' sociologist, they reached almost identical conclusions. Both writers presented evidence to support their views, but the main evidence has been supplied by Bogue[148], who also restated the dominance hypothesis.

Bogue accepts that the ecological concept of dominance can be applied to the metropolis[149]. A dominant species is one which is well adapted to prevailing conditions, and which creates certain environmental conditions

necessary for the survival of lesser species. The dominant species itself may be dependent on the lesser species for certain functions and preserving the existing environmental conditions. Following this analogy, the dominant city... "controls many of the conditions of life of all the communities lying within a broad area surrounding it."[150] This control arises from a high degree of specialization in services and retailing, and from an ability to foster industrial development.

> "The metropolitan market centre mediates a complex intercommunity exchange, and thereby integrates the activities of outlying communities with each other and with the activities of the metropolis. The single hinterland community must rely upon the central city to preserve the balance which is thus attained among the parts".[151]

A hinterland city adapts to its subdominant condition by specializing in one or more of the service activities and through acting as intermediary between the metropolis and hinterland.

Bogue is aware that the metropolitan centre is not the sole supplier of goods and services consumed within its hinterland, but that it is the main supplier, especially in areas close to the metropolis. However, for Bogue as with Gras, the key to metropolitan dominance is the inter-dependence of the constituent parts: the metropolis, the subdominant towns and the hinterland.

Bogue produced a vast amount of evidence to show that in the U.S.A., many human activities decrease in intensity with increasing distance from the metropolis. This was found to be true for population densities, value added by manufacture, retail sales, wholesale sales and receipts from services.

Further evidence for the 'metropolitan hypothesis' was supplied by O. D. Duncan et.al. using 1950 U.S. census data.[152] However, where Bogue gave emphasis to McKenzie's concept of the metropolis dominating its hinterland, Duncan gave more emphasis to the concept developed by Gras[153] and Vining[154] of the metropolis as part of a system of inter-metropolitan relationships. The two approaches are mutually re-inforcing. Both studies show that the concepts of metropolitan dominance and inter-

relationships give a valid explanation of the economic and social organization of the U.S.A.

Further evidence is supplied by Vance and Smith[155] who used six indices - wholesale sales, business services receipts, number of branch offices, retail sales, bank clearings, and value added by manufacturing - to investigate patterns of dominance in the southern U.S.A. Vance and Smith were able to identify different levels of dominant and subdominant cities in the South.

Further evidence that the dominance effect decreases with distance from the centre has been supplied by C. H. Madden using U.S.A. population data for the period 1790-1950[156]. Madden shows that generally the largest cities are located close to the metropolitan centres and that rates of city growth decline with distance from the centre.

Further evidence of metropolitan dominance exists, although at times giving conflicting or equivocal results. The correlation between the growth of village populations in the mid-west of the U.S.A. and distance from metropolitan centres was found by Hassinger[157] to be positive and by Hart and Salisbury[158] to be negative. Rikkinen[159] has shown that these differences are reconcilable, and that distance from urban centres does influence village population growth.

Anderson and Collier[160] show that metropolitan dominance influences farm size, but that farming type determines whether it is an increase or decrease in size. They also found that distance from the nearest urban centre (25,000 + population) gave a better gradient fit than distance from the nearest metropolis. As far as farm practise is concerned, it is urban dominance rather than metropolitan dominance which is important.

Martin

Martin has suggested that the ideas of metropolitan dominance can be subsumed under a gradient principle and a differentiation principle.[161] The gradient principle states that urban influence in rural areas varies directly with the size of a city, and inversely with distance from that

city. The differentiation principle states that urban centres transform rural areas with simple functions into areas with specialization of function or differentiation, and that this also varies directly with the size of a city and inversely with distance from that city. Martin regards the two principles as complementary.

The essence of differentiation is that away from the cities the economy is simple and homogeneous, and that close to the city specialization of function invariably leads to specialization of area. Martin believes differentiation to be very important, despite the lack of detailed studies and supporting evidence.[162]

There is more evidence to support the gradient principle, as noted above in the works of Gras, Bogue, etc. The gradient principle is also implied in the works of Von Thunen[163] on agricultural regions, Stewart[164] et.al. on gravity models, Zipf[165] on human behaviour, Ravenstein[166] and Stouffer[167] et.al. on migration, and in the work on rural-urban fringes. This last concept is based on the observed interdependence and interaction between the urban and rural sectors.[168] Although some authors[169] accept the concept in a geographical sense, others, notably Pahl[170], deny this.[171] "Any attempt to tie particular patterns of social relationships to specific geographical milieux is a singularly fruitless exercise".[172]

Friedmann

J. Friedmann's analysis represents a synthesis of earlier theories on regional development. Friedmann believes that industrialization and urbanization are usually concentrated into one, or a very few areas. (Industrialization + Urbanization = Polarization). This leads to an advanced 'centre' and a backward 'periphery'.[173] Economic development originates in the core and then spreads to the surrounding regions. This accounts for the phenomena of dual societies, declining agricultural areas and underdeveloped regions in new countries.[174]

For Friedmann the key concept is T. W. Schultz' theory that it is near the urban-industrial matrix that economic organization (especially commodity and factor markets) works most efficiently.[175] Some evidence has been

supplied to support this theory and is discussed below.[176] Schultz' theory accords with Bogue's concepts and evidence on metropolitan dominance. The tendency for economic growth to lead to centre-periphery divergence is accordant with Myrdal's cumulative causation principle. Lastly Friedmann's ideas are in harmony with Hirschman's advocacy of disequilibrium growth.

Friedmann devotes considerable attention to the problem of whether regional disparities in income are converging or diverging. Evidence suggests that equilibrium conditions do not set in and Friedmann examines the possible reasons for this:- the failure of diminishing returns to set in at the metropolitan centre; the failure to perceive peripheral investment opportunities; the faster growth in demand for goods produced at the centre than for those produced in the periphery; the inability of the periphery to adjust to changing conditions; etc.[177] Regional income disparities may also depend on overall levels of wealth, the richer nations having lesser disparities because they have more 'balancing factors' and therefore spread of growth.

From this analysis, Friedmann proposes the following account of regional economic development.[178] First, all regions are in part 'closed' economies and in part 'open' economies. Some economic flows (commodities, factors, etc.) do cross regional boundaries. The extent to which a region is 'open' determines how much it can be subject to external influences. Regional economic growth is usually externally induced, especially in the initial stages. Successful adaptation from a narrow export-based economy to a self-sufficient and self-sustaining economy depends on the socio-political structure of the region, the local distribution of income and the local pattern of expenditures. These factors determine the size of the regional multiplier and the rate at which local investment opportunities are taken up. Local leadership and initiative play a decisive role in this adaptation. Regional economic growth is largely a problem in the location of firms. However most firms prefer urban locations because of 'economies of urbanization'.

Friedmann lists these:-

i) a plentiful supply of labour and skills
ii) a well organized capital market
iii) proximity to buyers and sellers (to markets and materials)
iv) provision of ancillary services
v) provision of an urban infrastructure.

In summary, Friedmann states that economic activity occurs in space through, a) a system of cities, arranged in a partial hierarchy according to the functions performed by each city; and b) the corresponding areas of influence. From this Friedmann derives four principles of regional growth:-

i) The population of an urban area is proportional to the population of the central city. Bigger cities have larger dependent populations.
ii) The spatial incidence of economic growth is a function of distance from a central city.
iii) The growth potential of an area situated along an axis between two cities is a function of the intensity of interaction between them.
iv) Impulses of economic growth are transmitted from higher to lower centres in the urban hierarchy. Thus, large cities play a key role in extending growth across the entire system of the space-economy.

As a policy programme Friedmann suggests that the 'periphery' areas should be eroded away by the establishment or promotion of growth poles at the boundary or within the backward areas. These growth poles will be the centres of economic development, able to supply goods and services to the surrounding region. They will be the centres of the local transport networks. They will become centres of internal migration. The job of the policy makers will be to identify potential growth poles, which will be intermediate-sized towns with a high capacity for growth, situated in the backward areas.[179] The development strategy includes ensuring that an adequate standard of central services exists in the growth pole; improving the communications network of the region and concentrating it on the growth pole; developing light, labour intensive industries, and changing the structure of agriculture in order to help the spread of economic growth throughout the region.

Conclusions

At present the American and French contributions to growth-pole theory reveal little more than a loose collection of ideas and opinions and contain nothing that could be construed as a coherent or established theory. These contributions contain many limitations for they are based on unfounded behavioural assumptions and often embody contradictory statements such as those concerning the role of a propulsive industry. Furthermore they contain little which can be of practical assistance in regional planning. Without a coherent theory of how growth poles operate it is impossible to forecast the effects they may have, whether they would achieve the aims of regional plans and if so, under what circumstances they would have most effect.

Despite these limitations the growth-pole concept has been popular with governments and administrators. During the 1960's growth-pole schemes were being advocated or put into practice in many countries including England[180], Scotland[181], Wales[182], Norway[183], Denmark[184], Italy[185], and Angola[186]. Also growth-pole schemes have been proposed to deal with a wide variety of situations. Most form part of a programme to promote economic growth in less developed regions, but also they have been advocated as a means for developing recreational facilities[187] and organising the administrative structure of a developing nation[188]. However the existence of over a decade's experience with growth poles has added little to our knowledge of what they are or how they function.

In the absence of general principles by which growth poles can be judged it is important to know the particular aims of an individual scheme in order that it may be assessed according to its' own criteria.

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## Chapter 6

# THE SPANISH GROWTH-POLE SCHEME, ITS AIMS AND CHARACTERISTICS

### Introduction

The central objective of the Spanish National Plans is "to raise the standard of living of the Spanish people as quickly as possible commensurate with economic stability"[1]. Within this general scheme the role of the regional development programmes is to reduce the wide regional disparities in the standard of living which exist in Spain[2]. In 1963 the Planning Commission stated that

> "the marked geographical inequality of per capita incomes which is not justified by geophysical differences or the distribution of human or natural resources is one of the fundamental problems of the Spanish economy".[3]

The regions with a low level of income per capita, Galicia, Andalusia, New Castile and the Duero and Ebro valleys, are not necessarily the regions with the least resources. In order to overcome this imbalance regional development in the first National Plan (I Plan) was centred around four policies:

a) The creation of industrial growth poles in zones of low income,

b) the promotion of joint development schemes between local authorities and the administration,

c) agricultural reform programmes,

d) the direction of internal and external migration movements in accordance with the needs of economic and social development[4].

However later in the Plan these four items were reduced to two, the agricultural reform programmes and the industrial growth-pole scheme[5]. The Spanish government has yet to formulate a policy on internal migration movements despite the important effect of these movements on economic development[6]. Similarly during the I Plan there was no policy on joint development programmes, although in the II and III Plans some attempt was made to channel monies available under the planes provinciales scheme towards the poorer provinces and to raise local authority spending in these areas[7].

From various statements in the I[8] and II Plans[9] as well as from interviews with planning officials[10] it is clear that the Planning Commission regarded the industrial growth-pole scheme as the main element of regional planning policy during the I Plan.

The Aims of the Growth-Pole Scheme

The aims of the industrial growth-pole scheme as stated in the I Plan were twofold, to create non-agricultural jobs and to promote new 'nuclei' of firms. These new firms would be based on the natural resources of a region or on other elements within the growth pole favourable to industrial location. The scheme was intended to overcome the excessive dependency of the backward regions on agriculture[11].

The growth poles were to be located in areas of low income and were expected to have a propulsive action capable of restructuring the surrounding area and influencing its general development. In order to have maximum effect they were to be based on those cities which had overcome their initial inertia and already had an appreciable level of industrial activity[12]. In essence the growth poles were to be located in the natural centres of large backward zones[13]. The Planning Commission recognised two types of growth pole, the polo de promoción which had practically no industrial base and required a high level of assistance and benefits, and the polo de desarrollo which had some existing industries and required a lower level of assistance. When formulating this policy the Planning Commission, although aware of the wide range of literature on growth poles, were strongly influenced by the ideas of the French school and in particular by F. Perroux's concept of the growth pole[14].

During the II Plan the growth-pole policy was revised in the light of the experience gained in the I Plan. These revisions involved adjustments to the administrative process rather than any change in policy and included the following:

a) giving more emphasis to the coordination of activities between Ministries and other bodies involved in developing the growth poles,

b) increasing administrative flexibility in dealings with the growth-pole firms,

c) requesting firms to give more precise and realistic figures about their investment programmes,

d) revising the conditions and size of the benefits granted under the scheme[15].

New growth poles were designated during the II Plan and several of the original growth poles were phased out, there being no more than seven growth poles at any one time (see Chapter 3). The growth poles were designated for a period of five years in the first instance, with an option of this being extended for a maximum of a further five years. Those growth poles which already had a significant industrial base were generally designated for a short period and the growth poles in the less developed cities for the full ten years.

The III Plan saw a major restatement of the objectives of regional planning in Spain. It was realised that a high social cost was involved and that regional development was being bought partly at the expense of national economic growth. The Spanish planners believed that a careful re-definition of regional policy was necessary if this dichotomy was to be avoided in future. The new objectives were as follows:

a) to obtain the maximum possible growth of the national product through an optimum use of resources within Spain,

b) to reduce the regional disparities in levels of economic growth and levels of economic well-being,

c) to improve the integration of the regional economies within the national economy,

d) to reduce the inequalities of employment opportunity between the Spanish regions,

e) to integrate the Spanish economy as closely as possible with international markets.[16]

In effect, national policies, such as the pursuit of a maximum economic growth rate and integration with international markets, particularly the E.E.C., were to be developed at the regional level and to become an integral part of regional policy. Under this new scheme it was decided that the growth-pole policy should continue in its present form until the last two poles, Logroño and Villagarcía de Arosa were completed in 1981,

but that no new growth poles should be established. This decision was taken following the experience of the I and II Plans when it was realised that the existing growth poles would require a very high level of investment in infrastructure. It was thought that the maintenance of this high level of investment in a large number of growth poles would impose harmful effects on national economic growth.[17] It was felt that with its termination in 1981 the growth-pole scheme would have reached a point of saturation and that all the centres with the minimum necessary conditions would have been included within the scheme by then. Also it was felt that to spread the scheme to new centres would have lost the 'selective' nature of the policy and would have spread the benefits too thinly over too wide an area.[18]

Operation of the Growth-Pole Scheme and the Benefits Available under the Scheme.

The organisation and administration of the growth poles is the responsibility of the Planning Commission. The Planning Commission has its' own budget which it has used to promote the construction of industrial estates, new water and drainage schemes and road improvement schemes (see below Chapters 8 - 14). The Planning Commission also co-ordinates the activities of the other government agencies such as the Ministry of Public Works, the Ministry of Housing, Renfe, etc. that are involved in the development of the infrastructure of the growth poles.

Each growth pole has a manager who has his offices located within the administrative area of the growth-pole and who acts as the point of contact between the central administration and the firms within the scheme. The growth-pole manager is assisted by the local provincial economic council of the Sindicatos organisation. He acts as promoter for his growth pole, organising publicity material, etc., and vets the applications made by the firms ensuring that all the documentation is correctly presented before sending the application on to Madrid. The manager also has the task each year of checking that each firm has achieved the norms agreed under its growth-pole agreement.

The basis of the growth-pole scheme is an agreement between the central administration and private firms that the administration will grant certain economic and other benefits in return for which the private firms carry out various industrial activities, and/or fulfil certain social objectives[19].

Any firm or private organisation may apply for the government benefits, provided that they are located in, or intend to be located within the territorial limits of the growth pole, that they are above a certain minimum size and that they will contribute directly to the economic and social development of the region[20]. Benefits may be granted to firms new to the growth pole or to existing firms wishing to make extensions to their factories. Non-industrial organisations may also apply for benefits provided they undertake to fulfil certain 'social' targets. For this reason a small number of schools and colleges have been included in the growth-pole scheme[21].

It is the responsibility of the individual firm or organisation to make the request to be included within the scheme and to specify which benefits it would like to receive. Each applicant has to fill in a standard form giving the background details of the firm and information about the proposed new installation. This information is grouped into the following categories:-

a) ownership of the firm including details of foreign holdings of shares, names of directors and managers, etc.,

b) ownership of the land including a diagram indicating the location of the firm and any proposed new buildings,

c) the budget of the planned investment including the cost of land and buildings, details of new machinery of both Spanish and foreign origin, etc.,

d) the sources of finance for the proposed investment including official credit,

e) details of envisaged sales, production costs, annual production, etc.,

f) a programme of investment indicating at which stage each phase of the installation would become effective,

TABLE 6:1

The Benefits Granted to Firms in the Growth-Pole Scheme.

| Types of Benefits | Scale of Benefits | | | |
|---|---|---|---|---|
| | A | B | C | D |
| 1) Freedom from official debt repayment during the first five years. | Yes | Yes | Yes | Yes |
| 2) Preference in obtaining official credit failing other sources of finance. | Yes | Yes | Yes | Yes |
| 3) Compulsory purchase of land for installations or access. | Yes | Yes | Yes | Yes |
| 4) Reduction in the industrial tax (fiscal licence). | 95% | 95% | 95% | 95% |
| 5) Reduction in the urban land tax. | 80% | 80% | 80% | 80% |
| 6) Reduction in the tax on share issues and loans where the funds obtained are used to finance new installations. | 95% | 95% | 50% | No |
| 7) Reduction in the tax on the transfer of property. | 95% | 50% | 50% | No |
| 8) Reduction in the tax on expenditure for the acquisition of machinary and equipment. | 95% | 50% | 50% | No |
| 9) Tariff reductions on imported machinery, etc., when these are not manufactured in Spain. | 95% | 50% | 25% | No |
| 10) Reductions in the taxes or rates levied by Local Authorities on the establishment or enlargement of industrial premises. | 95% | 95% | No | No |
| 11) Subsidies on fixed capital investments in the polos de desarrollo. (For the polos de promoción the subsidy can be as high as 20% of the investment). | 10% | 5% | No | No |

Source: Planning Commission, Legislación económica II. Plan de desarrollo, Madrid (1964).

g) details of employment including for the categories of directors, technical and administrative staff, and workforce,

h) improvements of a social nature including details of extra wages, bonuses, housing for the workmen, the creation of scholarships and schools for the workmen's children, etc.[22]

The benefits which a firm may gain include a subsidy of up to 20% on the fixed capital investment, reductions in certain national and local taxes, preference in obtaining official credit and the right of compulsory purchase of land at a reasonable price. Details of these benefits are given in Table 6:1 . Each firm is placed in one of four categories (A, B, C, or D) according to the level of the benefits that they are to receive (Table 6:1).

The benefits granted to the firms in the polos de promoción differ in three respects from those granted to the firms in the polos de desarrollo. First, firms in the polos de promoción may receive subsidies of up to 20% of the fixed capital investment compared with a maximum of 10% in the polos de desarrollo. Second, the minimum size of investment necessary to qualify for benefits is much lower in the polos de promoción than in the polos de desarrollo. At first the minimum size was a fixed capital investment of 3 million pesetas and 20 new jobs in the polos de promoción and 5 million pesetas and 30 new jobs in the polos de desarrollo, but these were changed in January 1967 to 30 million pesetas or 50 new jobs in the polos de promoción and 40 million pesetas or 100 new jobs in the polos de desarrollo. Thirdly there are no restrictions on the types of firms or organisation which can apply for benefits in the polos de promoción, whereas only firms within specified industrial sectors can apply for benefits in the polos de desarrollo (Table 6:2 ).

The applications for benefits are organised through an annual concurso or call for bids.[23] (In 1964 the concurso was arranged in two stages with a call for bids in April and another in July). Each year the Delegate Committee for Economic Affairs announces in the Boletín Oficial del Estado the details of the concurso, the final dates of application and lists of those industrial activities in the polos de desarrollo which will qualify

TABLE 6:2

Industrial Activities Which Qualify for Benefits in the Five Polos de Desarrollo.

Corunna

1) Food industries
2) Textiles and clothing
3) Wood and Furniture
4) Leather
5) Rubber
6) Chemicals
7) Siderurgical and non-ferrous metals
8) Metal products
9) Electrical machinery
10) Precision and control machinery
11) Secondary education and professional training

In 1965 the following amendments were made. Excluded from the scheme were the rubber and rubber products industries and from the food industries the drinks (except for fruit juices) and the conserving and packaging of fish and shellfish industries. The additions to the scheme were the printing industry; the paper industry; the construction, glass and ceramics industry; and the ship repair industry.

Seville

1) Food industries
2) Textiles and clothing
3) Paper products
4) Printing and publishing
5) Leather products
6) Chemicals
7) Construction, glass and ceramics
8) Siderurgical and non-ferrous metals
9) Metal products
10) Machinery
11) Electrical machinery
12) Transport equipment
13) Precision and control machinery
14) Secondary education and professional training

In 1965 the following amendments were made. Excluded from the scheme were the machinery industries and from the food industries the drinks industries (except fruit juices). The rubber and rubber product industries were included within the scheme.

TABLE 6:2 cont.

Valladolid

1) Food industries
2) Textiles and clothing
3) Wood and furniture
4) Chemicals
5) Siderurgical and non-ferrous metals
6) Metal products
7) Machinery
8) Electrical machinery
9) Transport equipment
10) Precision and control machinery
11) Secondary education and professional training

In 1965 the following amendments were made. Excluded from the scheme were the machinery and wood and furniture industries and from the food industries the drinks industries (except for fruit juices). The paper products and construction, glass and ceramics industries were included in the scheme.

Vigo

1) Food industries
2) Wood and furniture
3) Paper products
4) Publishing and printing
5) Chemicals
6) Construction, glass and ceramics
7) Siderurgical and non-ferrous metals
8) Metal products
9) Machinery (excluding electrical machinery)
10) Transport equipment
11) Secondary education and professional training

In 1965 the following amendments were made. Excluded from the scheme were the wood and furniture industries and from the food industries the drinks industries (except for fruit juices). The clothing and fabrication of fishing net industries and the rubber products industries were included within the scheme.

TABLE 6:2 cont.

Saragossa

1) Food industries
2) Wood and furniture
3) Leather products
4) Paper products
5) Publishing and printing
6) Chemicals
7) Siderurgical and non-ferrous metals
8) Metal products
9) Machinery
10) Electrical machinery
11) Transport material
12) Secondary education and professional training

In 1965 the following amendments were made. From the food industries the drinks industry (except for fruit juices) were excluded from the scheme. The construction, glass and ceramics industries were included in the scheme.

Source: Planning Commission, Legislación económica 11. Plan de desarrollo, Madrid (1965).

for the benefits. All applications are considered by the Delegate Committee for Economic Affairs which decides which firms or organisations should receive the benefits and what level of benefits (categories A, B, C or D) each successful firm should receive. The list of successful firms and the level of benefits they may receive is published in the Boletín Oficial del Estado. Within ten days of publication the Planning Commission, through the growth-pole managers, must notify the firms of the terms and conditions which the firms must fulfil if the benefits are to be granted. The firms do not have to accept these terms and they may renounce the agreement, although of course they immediately forfeit their benefits. In certain growth poles a significant number of firms have decided to renounce the agreements[24].

If for any reason the conditions, objectives or guarantees are not fulfilled by the firm the State has the right to reclaim the benefits it has granted even to the extent of expropriation of the firm's land and installations.

Selection of the Growth-Pole Towns

At the start of the I Plan seven towns were chosen to be the first industrial growth poles. There was no special significance in this number although it was thought that seven was approximately correct. Economic resources were limited and it was thought essential not to spread them out too thinly amongst a large number of growth poles and thereby fail to promote an adequate level of industrial activity in each pole[25]. The decision to create seven growth poles was also a by-product of the selection process. From the original study areas only seven towns were thought to have suitable qualifications to be considered as growth-poles[26].

In January and February 1963 five internationally-based firms of economic consultants (Sofemasa, Seretes, Meeting, Doxiadis and George Fry and Associates) were each commissioned to make a study of one of the more backward regions of Spain. Three of the firms were asked to study a second region as well, making a total of eight regions investigated (Figure 6:1). The approach adopted by the five consultancy firms

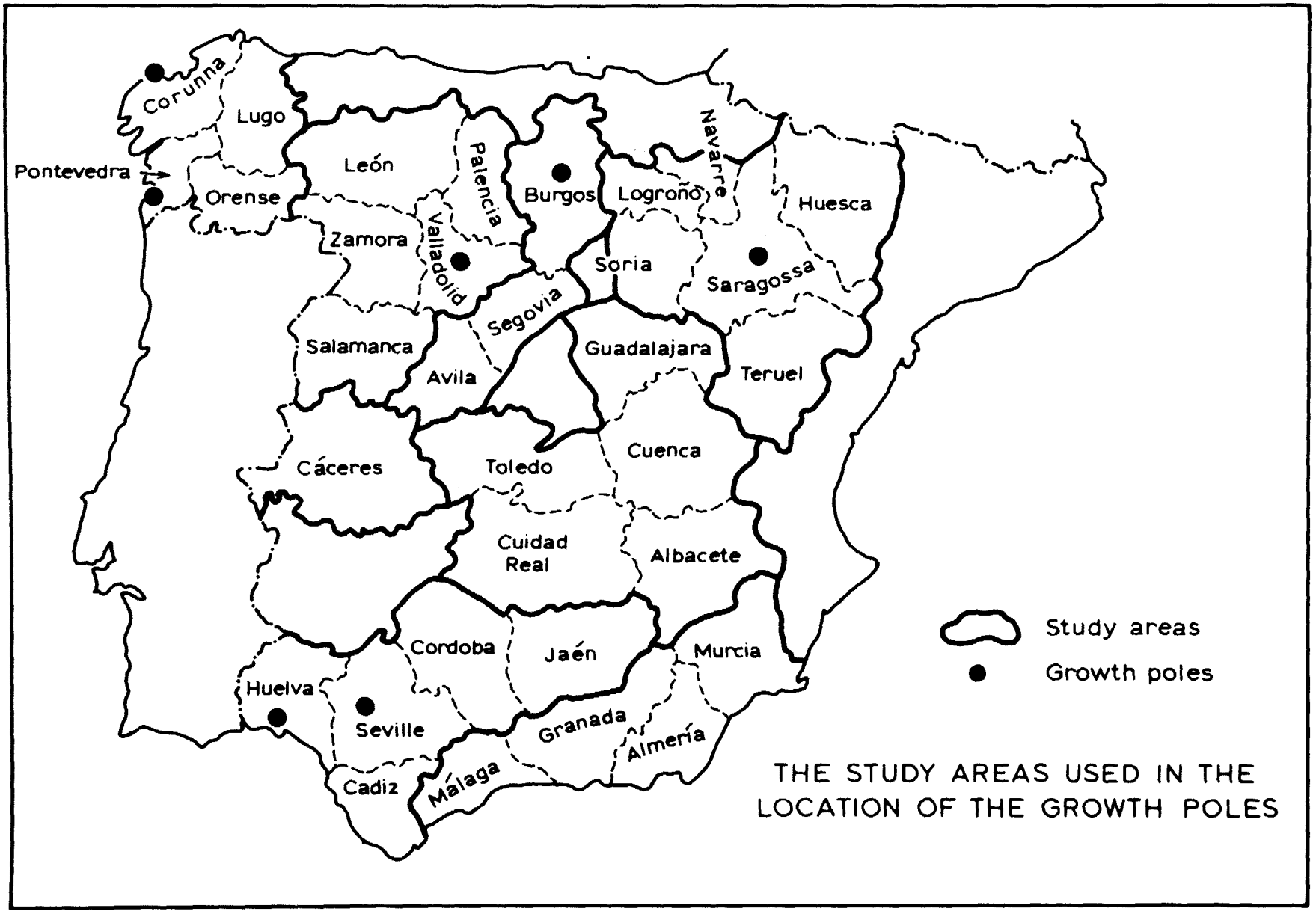
Corunna
Lugo
Pontevedra
Orense
León
Palencia
Burgos
Navarre
Logroño
Huesca
Zamora
Valladolid
Soria
Saragossa
Segovia
Salamanca
Avila
Guadalajara
Teruel
Cáceres
Toledo
Cuenca
Cuidad Real
Albacete
Cordoba
Jaén
Murcia
Huelva
Seville
Granada
Almería
Cadiz
Málaga
Study areas
Growth poles
THE STUDY AREAS USED IN THE LOCATION OF THE GROWTH POLES

FIGURE 6:1

varied considerably, particularly in the methods of analysis and statistical techniques used, although each report contained a detailed survey of the natural resources, infrastructure, human resources and existing industrial base of each of the study regions.

Most of these studies were completed within five months and reports containing planning recommendations were presented to the Planning Commission in early June. During the rest of June and the first week of July these reports were discussed by the Planning Commission and the consultants, and later by the Planning Commission and government representatives. Finally on the 12th July, 1963 a meeting of five expert assessors, D. Hernán Cortés Rodríguez, D. Lorenzo Gil Piláez, D. Manuel Martin Lobo, D. Jose Manuel Casas Torres, and D. Juan Plaza Prieto, considered which towns should be selected as growth poles.

Justification for the choice of growth poles was made in the planning report on regional development for the II Plan,[27] and is summarised below.

In Galicia there are two main zones of industrial development, the coast zone from El Ferrol to Vigo, and an interior zone consisting of the two towns of Lugo and Orense. The first zone is thought to contain the greater potential for industrial development and two growth poles, Vigo and Corunna, were chosen from this area. Both towns have superb natural harbours and busy ports (see below Chapters 10 and 12). This compensates in part for their lack of good interior communications which is one of the major handicaps facing industrial development in Galicia. Also both towns can promote port-based industries as well as industries based on the raw materials of the region. Lastly it was thought that the interior towns of Lugo and Orense are, respectively, within the spheres of influence of Corunna and Vigo and that their development is associated with these coastal towns[28].

The region of Old Castile was the subject of two studies, one by the firm Seretes for the five provinces of León, Palencia, Valladolid, Zamora and Salamanca; the other by the firm Meeting for the three provinces of Burgos, Segovia and Avila (Figure 6:1). Old Castile is an area where

economic activity is, in the Planning Commission's words, "excessively dispersed"[29] with only a few nuclei of industrial activity situated mainly on the routes between Madrid and the Cantabrian coast. A survey of the towns in the western part of the region suggested that Salamanca, Zamora and León were less centrally placed than Valladolid. Palencia was thought to lie within the sphere of influence of Valladolid, and anyway the town would soon be receiving assistance through the plan for the Tierra de Campos. In the eastern part of the region Segovia and Avila were thought to lie within Madrid's sphere of influence and only Burgos, with the advantage of being on a main north-south route, was thought able to influence a considerable area of Old Castile. Both Valladolid and Burgos were thought to be well located for those industries wishing to distribute goods to the main consuming centres of the country.

Andalusia was made the subject of two studies for the western and eastern provinces of the region (Figure 6:1). After examining the two reports the Planning Commission thought that the main possibilities for development lay in the Huelva, Seville and Cádiz area. Of these three towns it was thought that Huelva had great possibilities for the establishment of a chemical and metallurgical complex, and Seville for agricultural-based industries and those firms requiring a central location within Western Andalusia. Although the eastern region was observed to contain various advantages, notably an ample supply of labour, a prosperous agricultural sector and a rapidly growing tourist trade, it was noted that the infrastructure of the area has certain deficiencies, especially a shortage of water, which restrict the possibilities for new industrial developments. However the Planning Commission thought that once these deficiencies were removed it would be possible to have one or more growth poles in this region[30].

The study of the middle valley of the Ebro differed from the other studies in that it referred to a natural feature, the Ebro valley, as much as to a group of provinces. For this reason the study only considered the southern part of the province of Navarre and the eastern part of the

province of Soria (Figure 6:1). The directive for this study was to investigate the possibilities of creating a major economic centre in between the main Spanish industrial regions of the Basque provinces and Catalonia. The study area is dominated by the city of Saragossa which lies at the centre of the region and which also has a well established industrial tradition (see below Chapter 14). The only other town to receive serious consideration was Logroño, which the Planning Commission thought would also be suitable as a growth pole.[31]

Apart from these studies the firm Seretes prepared a one volume report on the province of Cáceres which formed an adjunct to their study of the western region of Old Castile. However Cáceres was thought to contain few possibilities for industrial development. Similarly an analysis was made of five provinces of New Castile: Guadalajara, Toledo, Cuenca, Ciudad Real, and Albacete, but the Planning Commission came to the conclusion that there were insufficient technical and natural resources for the establishment of an important and dynamic industrial centre in any of the five provinces.[32]

In general the Planning Commission followed the advice contained in the consultants' studies on the question of choice of growth poles. The one exception is the case of Burgos. In the conclusions of its report on the three provinces of Burgos, Segovia and Avila the consultancy firm, Meeting, suggested that the town of Aranda de Duero had the most potential for industrial development. It is a town which has undergone fast population growth in recent years indicating a high degree of natural dynamism, which lies at the centre of the richest agricultural region of the area and which presents many opportunities for the establishment of agricultural-based industries. The consultants also thought that Aranda, together with Valladolid, would promote a strong axis of growth along the line of the Duero river.[33] Despite these recommendations the Planning Commission preferred to make Burgos the growth pole, and Aranda was designated one of the overspill towns for Madrid (see above Chapter 3).

It would be easy to find good reasons for criticizing the choice of these particular seven growth poles, and just as possible to find good

reasons for justifying their choice. However, a number of general points can be made about this selection. First, the choice of the study regions to a large extent determined the choice of growth poles. For example, the choice of the middle valley of the Ebro as a study area made the choice of Saragossa as a growth pole almost inevitable. Within the study area Saragossa is clearly the largest and most industrialized city. Saragossa also lies at the centre of the area and is best able to influence economic development throughout the rest of the region. If a different study area had been chosen, with Saragossa lying near its periphery rather than in the centre, then it would not have been such an obvious choice as growth pole.

A second general comment which can be made about the choice of growth poles is that although their selection may have been quite reasonable in terms of the original study areas, the selection is less reasonable when considered in the context of the nation as a whole. Out of the seven original growth poles three are situated in the wealthiest north-eastern segment of the nation, whilst the poorest provinces which are located in western and southern Spain remain unaffected by the growth-pole scheme. In this context it was, perhaps, unfortunate that no growth pole was established in the New Castile study region. This whole question of the location of the growth poles in relation to the poorest regions of Spain is examined in more detail in Chapter 7 below.

A Survey of the Growth-Pole Firms

In an attempt to establish how successful the Spanish growth-pole policy has been a survey was made in 1968 of the firms that were within the scheme and in production at the time of the survey. The aims of this survey were twofold, to establish how far the policy was achieving the objectives laid down in the development plans, and to see if some of the theoretical concepts on growth poles, discussed in Chapter 5, were borne out in practice.

The surveys took the form of interviews-in-depth with the managing director, owner or company secretary of each firm. Interviews-in-depth were chosen rather than a postal survey partly because of the high no-

response rates associated with postal surveys, and partly because it was possible within an interview to establish the precise meaning of each question and therefore obtain the exact information required. Also by the end of an interview it was usually possible to have gained the confidence of the interviewee and thereby obtain a more candid response, particularly to questions concerning the scale of benefits received and the administration of the growth-pole scheme than would have been possible through a postal questionnaire.

The interviews consisted of a series of questions taken from a questionnaire with the responses being recorded on the questionnaire form. The interviews took, on average, two hours to complete, although in a few cases they took a whole morning or afternoon. Few of the interviews took much less than two hours to complete. Most of the questions could be answered immediately by the interviewee, but the more detailed questions concerning the costs of transport for materials and finished goods or the volume of production, usually required a consultation of the firm's records. In all 210 interviews were completed, which represented 80% of the firms in production within the growth-pole scheme in 1968.

A trial survey was conducted in Corunna in January and February 1968, and in the light of the knowledge gained amendments were made to the questionnaire. In particular it was found that the improvements to the physical infrastructure, the provision of industrial estates, the supply of water and electricity, etc., was often of equal or of more benefit to the firms than the various economic concessions and grants. This situation was noted also in a survey of four of the growth poles conducted by the Planning Commission.[34] The rest of the survey was conducted between April and September 1968, involving a stay of one month in most of the growth poles, but somewhat less in the cases of Vigo and Huelva which had fewer firms within the scheme.

A copy of the questionnaire is contained in Appendix C. The questions contained in Section 1 of the questionnaire were designed to establish the general background of the firm, its name and location, whether

it is of local or outside initiative, whether it is a single plant firm or within a group of companies. Section 2 was concerned with the labour force employed in the firm, its size and composition, its origin and training, and any special benefits it receives. There is a well established tradition in Spain, where housing is in short supply and the social and educational facilities inadequate, for such deficiences to be made up by employers. These benefits can be very important to the labour force and help to cause a significant rise in their standard of living. The figures for employment were sometimes rounded to the nearest ten, but as most firms had small fluctuations in their total employment this involved no serious loss of accuracy.

The questions in Section 3 were concerned with the ownership and the holdings of capital in the firm, and Section 4 with the history of the firm including the date of its foundation, the date when it came into production and any other significant facts.

Section 5 dealt with the inputs of the firm, their type, quantity, origin and costs of transport, and Section 6 with the same questions but for the products of the firm. In these two sections every attempt was made to get completely accurate figures although in the case of some firms this was not possible, partly through lack of time to make a comprehensive survey of the firm's records, and partly because these costs were constantly changing and so an average figure had to be taken. In such cases the interviewee, on the basis of the knowledge that was readily available, was asked to make 'an informed estimate' of the costs. It is thought that these estimates are accurate to within 5% of their true value and that any errors are not likely to make any significant difference to the results obtained.

Section 7 was an attempt to assess the economic environment of the firm in terms of competition from other manufacturers. The questions in Section 8 were concerned with the firm's attitude towards the local communication systems including the road, rail and telephone services. Transport and communications were of particular importance to those firms

in the more out of the way growth poles and to those firms located a long way from their markets.

Section 9 was concerned with the adequacy of the factory site and the location of the services (commercial, technical, legal, etc.) used by the growth-pole firms. This was an attempt to see how far the growth-pole city or region was able to supply the services required by a modern industry, the range and quality of services available to a firm often playing an important role in determining its degree of competitiveness.

In Section 10 questions were asked concerning the firm's attitude towards the growth-pole scheme and in particular whether the firm was satisfied with the economic benefits it had received. Section 11 dealt with the future plans of the firm and the nature of any planned extensions. Sections 12 and 13 were directed at those firms which had recently started production and dealt with the reasons why they had chosen to produce their particular products and the problems of starting production that they had encountered.

In Section 14 the firms were asked for the reason or reasons why they had chosen to be located in that particular growth-pole town. Again this section was directed at those firms which had recently started production. Section 15 was an open-ended question about the firm's future prospects, which gave the interviewee an opportunity to express his opinions about the growth-pole scheme, the local authorities, state control of the economy, etc.

The information gained from these interviews is discussed below in Chapters 8 - 16. In Chapters 8 - 14 an analysis is made of each of the seven original growth poles and, in accordance with the findings of the trial survey, emphasis is given to the physical problems encountered by the growth-pole firms. In Chapter 15 the experience of the seven growth poles is compared, particularly in terms of the original objectives of the growth-pole scheme, and in Chapter 16 an analysis is made of the growth-pole firms, their location and the pattern of industrial linkages they have created.

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4) Planning Commission (1963) op. cit. p. 42.

5) Planning Commission (1963) op. cit. p. 150.

6) Bradshaw, R., Internal migration in Spain, Iberian Studies, Vol. 1 No. 2 (1972) pp. 68 - 75.

7) Planning Commission, III Plan de desarrollo 1972 - 1975, Madrid (1971) pp. 373 - 394.

8) Planning Commission (1963) op. cit. p. 151.

9) Planning Commission, Desarrollo regional, Madrid (1969) p. 8.

10) These interviews occurred during 1967 and 1968.

11) Planning Commission (1963) op. cit. p. 64.

12) Ibid.

13) Planning Commission (1963) op. cit. p. 150.

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15) Planning Commission (1969) op. cit. p. 235.

16) Planning Commission (1971) op. cit. pp. 178 - 179.

17) Ibid. pp. 191 - 195.

18) Ibid. pp. 193 - 195.

19) Planning Commission, Beneficios en los polos de promoción y dessarrollo, Madrid (1967) pp. 7 - 15.

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21) Planning Commission, Relación de las empresas acogidas a los programas de desarrollo regional, Madrid (1968).

22) Details taken from a copy of the application form.

23) Planning Commission (1964) op. cit. p. 186.

24) Organización Sindical, Consejo Económico Provincial de Sevilla, Sevilla. Polo de desarrollo industrial: boletín informativo No. 12, Seville (1967) pp. 30 - 31. See also Chapter 14 below for a comment on the situation in Saragossa.

25) Planning Commission (1971) op. cit. p. 181.

26) Planning Commission (1971) op. cit. p. 182.

27) Planning Commission (1969) op. cit. pp. 182 - 183.

28) Ibid.

29) Ibid.

30) Ibid.

31) Ibid.

32) Ibid.

33) Meeting, Determinación de un possible polo industrial dinámico, Madrid (1963) passim. (Note: this is a planning document and has a restricted circulation).

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## Chapter 7

# THE PATTERN OF ECONOMIC DEVELOPMENT AND THE IDENTIFICATION OF GROWTH POLES IN SPAIN

## Introduction

In this chapter the basic patterns of development and underdevelopment in Spain are examined by use of trend surface analysis. The analysis is used as an exploratory technique to discover the national and regional spatial trends in income disparities in Spain, and some explanations for these trends are proposed. Having established the basic pattern of development the residuals are examined in an attempt to identify where the natural growth poles or provinces of high economic growth occur.

The techniques of trend surface analysis have been described elsewhere, for example in Krumbein and Graybill[1], McCullagh[2], and Davis[3]. In essence the technique involves the fitting of a surface, either a planar or a curved surface, to a set of data points. Trend surface analysis is a form of multiple regression analysis but with only two variables which represent the spatial co-ordinates $x_1$ and $x_2$. (In recent years the technique has been extended to include a third spatial co-ordinate to give a four dimensional trend surface. See Harbaugh, 1964[4]).

Trend surface analysis gives rise to two models[5]. The first is the generalization model in which total variance is divided into a general trend and local variations.

Total variance = Trend variance + Local variance + Error term

Norcliffe has criticised this use of trend surface analysis because of the impossibility of obtaining a completely objective definition of general trend variance and local variance, and suggests the use of spatial filtering techniques[6]. However, in practice these techniques require gridded data which were not available here.

The second model arising from trend surface analysis is the surface fitting model. This is mathematically similar to the generalization model except that the local component is considered not to be present.

Total variance = Trend variance + Error term

In this model interest is centred entirely upon the nature of the trend. This model was originally introduced in 1951 by Box and Wilson[7], although it existed before in a more simplified form (see for example Ezekiel's 1926 paper[8]). This model has also been used for finding optimum responses (see Davies 1954[9], and Hill and Hunter 1966[10]), and investigating the basic mechanism underlying the system under study (see Box and Youle 1955[11]).

In recent years there has been some controversy in the geographical literature over the application and interpretation of both trend surface models, (see Unwin and Lewin 1971[12]; J.C. Rodda 1971[13]; and K.J. Tinkler 1971[14]). There has also been criticism of the extension of trend surface analysis to problems involving social data (e.g. by Cerney[15]), and indeed there have been cases where erroneous conclusions have been drawn from inadequate investigations. However some of this criticism has been misdirected and many of the objections can be overcome by improvements in the methods used to obtain the trend surfaces. Attention will be paid in the following sections to the methods used to circumvent these criticisms.

The Analysis

The analysis used here employed the generalization model, although the rationale is taken from both models. The mathematical form of the model is:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + (\phi + \epsilon)$$

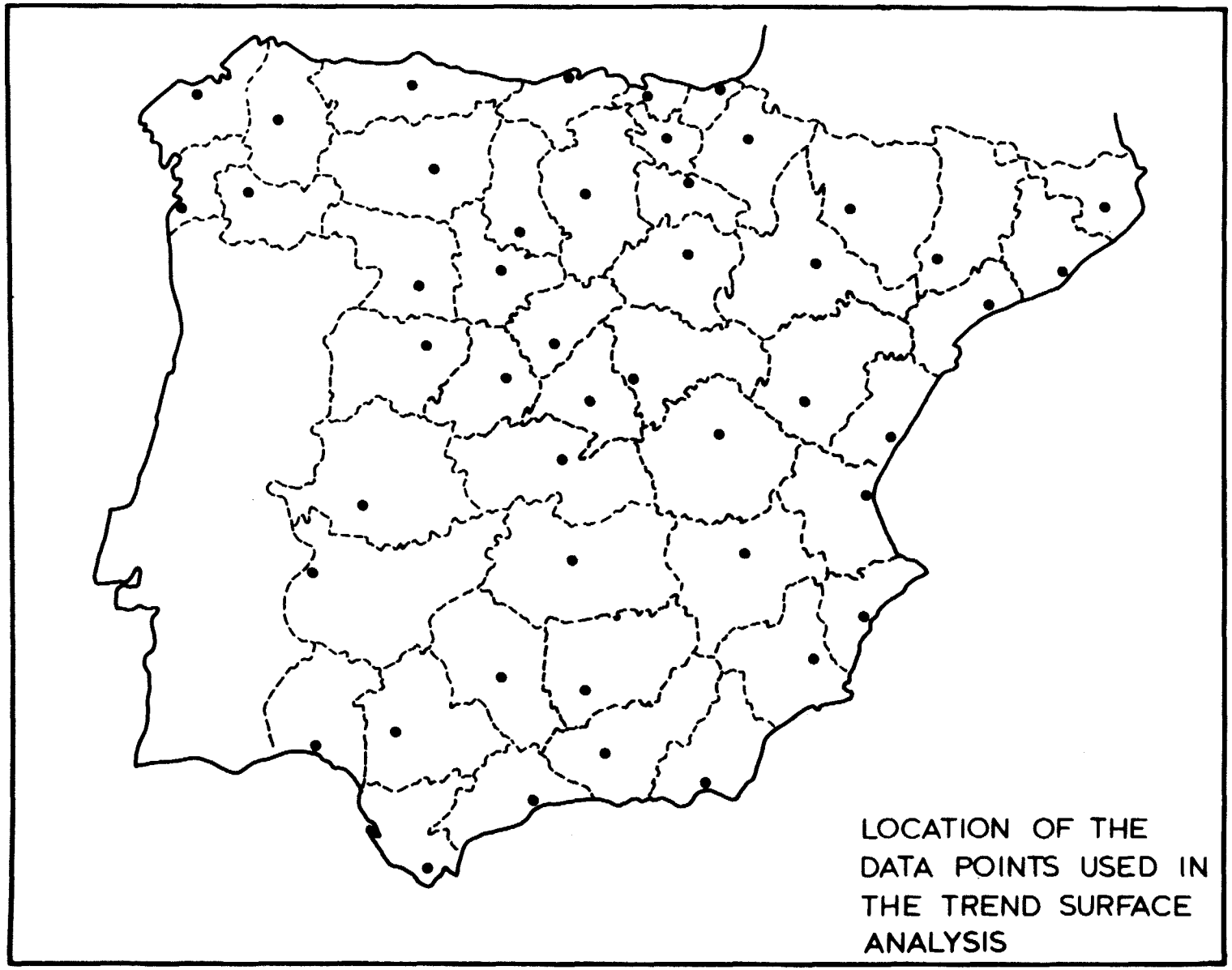
That is to say any response Y, here an economic response, will depend on the levels of a general trend measured by the spatial co-ordinates $x_1$ and $x_2$, a local component $\phi$ and an error term $\epsilon$, the rationale being that in a national economy there will be a large number of different economic forces

at work, so that although general trends may be observed they will be partly obscured by local conditions. These local conditions or local economic forces produce the local component $\phi$ . Unfortunately, without replicate studies it is impossible to distinguish between the local component $\phi$ and the error term $\epsilon$ . However, it is assumed that the error term is negligible in comparison with the local component, and that the deviations ( $\phi + \epsilon$ ) consist mainly of responses to local economic forces $\phi$ .

Trend surface models have often been used for hypothesis-testing purposes[16]; however they are used here more as a hypothesis-generating procedure. The model is used as an exploratory rather than a testing device, although the different surfaces generated act as a check on each other, and test the stability of the model (see below).

The data used was net value-added per active person for each of the 47 provinces of mainland Spain. Net value-added is the same as net production or the equivalent of national income, and is the normal measure of the level of a nation's economic activity. This data was obtained from the Banco de Bilbao's reports for the years 1955, 1960, 1962, 1964, and 1967[17]. (See Appendix A). The figures were supplied in the form of the total net value-added in each province and were then divided by the total active population for each province. From an economic viewpoint this gives a standard measure of the level of economic activity in each province. From a statistical viewpoint it gives the mean of the dependent variable $Y_i$ for each province, although it should be noted that no information is given concerning the variance of $Y$ [18]. However, from empirical knowledge of the data it is thought that the variance is fairly constant between provinces. These mean values were then ranged from 0 - 1,000 thereby enabling a comparison to be made between the various years.

The analysis requires that the data be given for a specific point such as a town rather than for an area such as a province. For this reason the



LOCATION OF THE DATA POINTS USED IN THE TREND SURFACE ANALYSIS

FIGURE 7:1

net value-added levels are taken as occurring at the capital city of each province. This can be defended on two grounds. First, the capital city is the most important centre of production in each province, indeed it is the only large town in many provinces. Secondly, many capital cities are located in the centre or near the centre of their provinces. There is one exception, the province of Pontevedra for which the town of Vigo has been used. Vigo is larger and economically far more important than the provincial capital.

Studies in trend surface analysis have emphasised the importance of having a regular distribution of data points[19] although the empirical work of Doveton and Parsley[20] suggests that this requirement has been over-emphasized in the literature. Nevertheless, from a practical viewpoint a regularly spaced distribution would minimize possible error occurring from this source. The location of the Spanish data points can be seen in Figure 7:1. To test their spacing nearest-neighbour analysis was used, there being insufficient data points for use of a Poisson distribution test. For the 47 capitals (including Vigo instead of Pontevedra) the analysis is as follows:

$$R = \frac{\bar{D}}{\bar{\Delta}}$$

where $\bar{D}$ is the observed mean distance between each point and its nearest-neighbour

where $\bar{\Delta}$ is the expected mean distance between each point and its nearest-neighbour

and $$\bar{\Delta} = \frac{1}{2\sqrt{p}}$$

and $p$ is the density of points in the area under consideration

$R$ is the nearest-neighbour statistic.

For the 47 cities:

$$\rho = 1.5666$$

$$\bar{\Delta} = \frac{1}{2\sqrt{1.5666}} = 0.3993$$

$$\bar{D} = 0.567$$

$$R = \frac{\bar{D}}{\bar{\Delta}} = \frac{0.567}{0.3993} = \underline{\underline{1.4199}}$$

A second set of response surface analyses was run, this time without the data for Madrid (see below). The nearest-neighbour R statistic for the remaining 46 cities is as follows:

$$\rho = 1.5333$$

$$\bar{\Delta} = \frac{1}{2\sqrt{1.5333}} = 0.4038$$

$$\bar{D} = 0.571$$

$$R = \frac{\bar{D}}{\bar{\Delta}} = \frac{0.571}{0.4038} = \underline{\underline{1.414}}$$

The results in both cases (1.4199 and 1.414) show that the distribution is more regular than random (a value of 1.0) but not completely regularly distributed (a value of 2.15)[21].

To test the significance of these results a Z test was used. The null hypothesis is that there is no difference between and , that the mean distance to nearest-neighbour is that expected in a random distribution of points.

Null hypothesis:

$$\bar{D} = \bar{\Delta}$$

Alternative hypothesis:

$$\bar{D} \neq \bar{\Delta}$$

The Z test is as follows:

$$z = \frac{\bar{D} - \bar{\Delta}}{\sigma\Delta}$$

$$\sigma\Delta = \frac{0.26136}{\sqrt{N\rho}}$$ where N is the number of measurements between nearest-neighbours

and $\rho$ is the density of points in the area under consideration.

For the 47 cities:

$$\sigma\Delta = \frac{0.26136}{\sqrt{47 \times 1.5666}} = 0.03045$$

$$Z = \frac{0.567 - 0.3993}{0.03045} = \underline{\underline{5.50738}}$$

For the 46 cities:

$$\sigma\Delta = \frac{0.26136}{\sqrt{46 \times 1.5333}} = 0.03112$$

$$Z = \frac{0.571 - 0.4038}{0.03112} = \underline{\underline{5.3725}}$$

At a 5% significance level in a two-tailed test we would accept the null-hypothesis with any value from -1.96 to + 1.96. As the completed values were 5.5 and 5.37 the null-hypothesis can be rejected. The distribution of provincial capitals in Spain definitely shows a more regular than random distribution, and there can be little danger of error caused by the spatial distribution of the data points occurring in the results.

Outliers

The problem of extreme values or 'outliers' is rarely mentioned in geographical work, although statisticians have stressed their importance and the need for careful treatment[22]. However, although the existence of outliers is one of the "really elementary problems of statistics"[23] the problem has, on the statistian's own admission, nowhere received adequate treatment[24].

Outliers can arise from a number of different causes such as faulty measuring devices, execution error during processing, and inherent variability of population. Consequently it is not possible to give a uniform and standard procedure for treatment. Outliers can be treated according to theoretical considerations where some a priori knowledge of

TABLE 7:1

Size of Madrid's Residuals expressed in terms of Standard Deviations.

| | Order of Surface | | |
|---|---|---|---|
| | 1st | 2nd | 3rd |
| Year | | | |
| 1955 | 1.58 | 1.78 | 1.89 |
| 1960 | 2.03 | 2.34 | 2.47 |
| 1962 | 2.34 | 2.52 | 2.64 |
| 1964 | 2.51 | 2.72 | 2.85 |
| 1967 | 2.78 | 3.06 | 3.16 |

Source: a trial analysis using all 47 data points.

the data and the processes involved is invoked to justify rejection or modification, or according to statistical criteria. A number of statistical methods have been suggested: i) truncation of extreme data, ii) Winsorization, iii) rejection according to some rejection rule, the most recent being that developed by Anscombe and Tukey[25].

A trial analysis was made of the data for first, second and third order surfaces for the five years 1955, 1960, 1962, 1964 and 1967[26]. In every case except one the most extreme residual value was for Madrid (see Table 7:1 for the size of the Madrid residuals, all residuals given in terms of standard deviations). The exception was the first order surface for 1955, when Guipúzcoa (2.49), Cádiz (1.81) and Orense (- 1.65) had larger residuals. In the second and third order surfaces for 1955 Madrid again had the largest residuals.

It is noticeable in Table 7:1 that the residuals increase in size from first to third order surfaces, suggesting that with better fit surfaces Madrid is seen to be in a more anomalous situation, and more importantly the residuals increase in size through time showing that Madrid's anomalous situation is becoming even more marked.

Anscombe and Tukey's rejection formula[27], using a premium at the 2.5% significance level suggests that on statistical grounds alone any residual above 2.733 standard deviations should be rejected (see Appendix D ). This would involve the rejection of only the 1967 Madrid data. However, there are more important theoretical reasons why all the Madrid data should be rejected.

It was stated as a basic postulate of the response model (above) that it should be used to investigate general economic forces influencing the process of economic development throughout Spain. However, the experience of Madrid is quite distinct from that of the rest of Spain. First Madrid did not grow up as the result of normal economic forces but was artificially created a capital city in 1561, at a time when the neighbouring city of

TABLE 7:2

The Improvement in the Percentage of Variation explained from an Analysis with the Madrid data to an Analysis with no Madrid data.

| Year | Order of Surface | With Madrid | No Madrid | Improvement |
|---|---|---|---|---|
| 1955 | 1 | 28.3% | 30.2% | 1.9% |
| | 2 | 56.5% | 61.9% | 5.4% |
| | 3 | 63.9% | 70.9% | 7.0% |
| 1960 | 1 | 24.2% | 27.0% | 2.8% |
| | 2 | 46.8% | 55.9% | 9.1% |
| | 3 | 58.3% | 70.1% | 11.8% |
| 1962 | 1 | 34.0% | 39.2% | 5.2% |
| | 2 | 55.0% | 65.9% | 10.9% |
| | 3 | 62.7% | 76.5% | 13.8% |
| 1964 | 1 | 39.6% | 46.6% | 7.0% |
| | 2 | 56.9% | 70.2% | 13.3% |
| | 3 | 61.1% | 77.4% | 16.3% |
| 1967 | 1 | 26.1% | 32.2% | 6.1% |
| | 2 | 43.2% | 58.2% | 15.0% |
| | 3 | 47.9% | 66.1% | 18.2% |

Source: a trial analysis using the Madrid data and Non-Madrid data.

Toledo was much larger and more important. Secondly, as the seat of government in a highly centralised economy Madrid provides many advantages to those businessmen who are locally based. Thirdly, foreign businessmen, who have formed an important source of new investment in recent years, have also tended to locate their enterprises in Madrid in order to remain close to the embassies, the government, and the international airport. The figures in Table 7:1 suggest that Madrid's advantages have grown in importance in recent years.

Because it forms such an important anomaly the data for Madrid has been omitted from the analysis. Such a procedure has to be taken with extreme caution. Nevertheless, the increase in the total sums of squares explained by the trend surface is thought to justify rejection. Table 7:2 shows the increase in percentage variation caused by rejecting the Madrid data. In most cases the increase is quite considerable, ranging from 1.9% for the first order surface in 1955 to 18.2% for the third order surface in 1967.

Choice of Trend Surface Model

Assuming that the analysis has been conducted as carefully as possible to eliminate any bias occurring in the results, the problem still remains of choosing a correct model form for the trend surface analysis. Four trend surfaces, of first, second, third and fourth orders were generated for each of the five study years. The problem then arises as to which of these surfaces is the correct one or, put in a more formal way, which functional form should be chosen?

Unfortunately, there is no clear answer to this question, although there are a number of guidelines to help in this choice. Goldberger[28] shows that this question can be tackled from two extreme positions. It is possible to take a 'theorist' viewpoint and identify the correct surface on theoretical grounds alone, or at the other extreme to take an empiricist viewpoint and "let the data speak for itself". However, as Goldberger points out, both positions have their limitations and it is usually

TABLE 7:3

The Percentages of Variance Explained for the Surfaces generated by the Non-Madrid data.

| Year | Order of Surface | Percentage Variance Explained |
|---|---|---|
| 1955 | 1 | 30.2 |
| | 2 | 61.9 |
| | 3 | 70.9 |
| | 4 | 75.9 |
| 1960 | 1 | 27.0 |
| | 2 | 55.9 |
| | 3 | 70.1 |
| | 4 | 77.8 |
| 1962 | 1 | 39.2 |
| | 2 | 65.9 |
| | 3 | 76.5 |
| | 4 | 80.7 |
| 1964 | 1 | 46.6 |
| | 2 | 70.2 |
| | 3 | 77.4 |
| | 4 | 83.6 |
| 1967 | 1 | 32.2 |
| | 2 | 58.2 |
| | 3 | 66.1 |
| | 4 | 74.8 |

Source: trend surface analysis using Non-Madrid data (46 points).

necessary to undertake a variety of procedures, partly theoretical and partly empirical, to gain a reasonable answer to the problem.

In the present case theoretical criteria are of limited value. Trend surface analysis is used here as an exploratory device and so theory is of little help beyond the general principle that the functional form should be as simple as possible consistent with the data point distribution[29]. From a more empirical point of view a number of tests are available. The first is the $R^2$ statistic showing the goodness-of-fit of the trend surface. The trend surface should 'explain' as much of the variance as possible, although the objective is not to explain perfectly all the features of a particular data set, but to construct a surface which best represents the trend for all five of the sample years. Table 7:3 shows the percentage variation accounted for by the trend surfaces of the non-Madrid data. These results show that whilst there is an important increase in the variance explained by changing from the first to the second order surfaces, there is a less important increase with the move to the third order surfaces and a still smaller increase with the move to the fourth order.

A second procedure useful in helping to choose the correct functional form is to apply a significance test to the results. In the case of trend surface analysis it is appropriate to use an F test[30]. The F test will tell if the $b_i$ coefficients are good estimators of the true population coefficients. However, the F test requires the fulfilment of certain assumptions[31]: i) that the population of the dependent variable is normally distributed, ii) that variance is constant throughout the regression, and iii) that the samples are drawn without bias from the underlying population. It was noted above that the variance of the data was unknown but thought to be constant. Similarly, from empirical knowledge of the data the population of the dependent variable is thought to be normal. The assumption of a random unbiassed sample, is, however, impossible to satisfy, for the means of the data were used. To sample from these means

TABLE 7:4

'F' test values for testing the significance of increasing the degree of the polynomial trend surface, using the Non-Madrid data.

| Year | 1st Order | 1- 2 Order | 2 - 3 Order | 3 - 4 Order |
|---|---|---|---|---|
| 1967 | 10.22 | 8.32 | 2.10 | 2.11 |
| 1964 | 18.73 | 10.67 | 2.88 | 2.33 |
| 1962 | 13.88 | 10.48 | 4.06 | 1.35 |
| 1960 | 7.98 | 8.73 | 4.35 | 2.12 |
| 1955 | 9.35 | 11.11 | 2.80 | 1.17 |
| Table values for the 'F' test at the various specified degrees of freedom. | 0.1%=8.12<br>1.0%=5.14<br>at 2,43 degrees freedom | 0.1%=6.59<br>1.0%=4.31<br>at 3,40 degrees freedom | 0.1%=5.86<br>1.0%=3.89<br>2.5%=3.17<br>5.0%=2.63<br>at 4,36 degrees freedom | 0.1%=5.48<br>1.0%=3.67<br>2.5%=3.02<br>5.0%=2.52<br>at 5,31 degrees freedom |

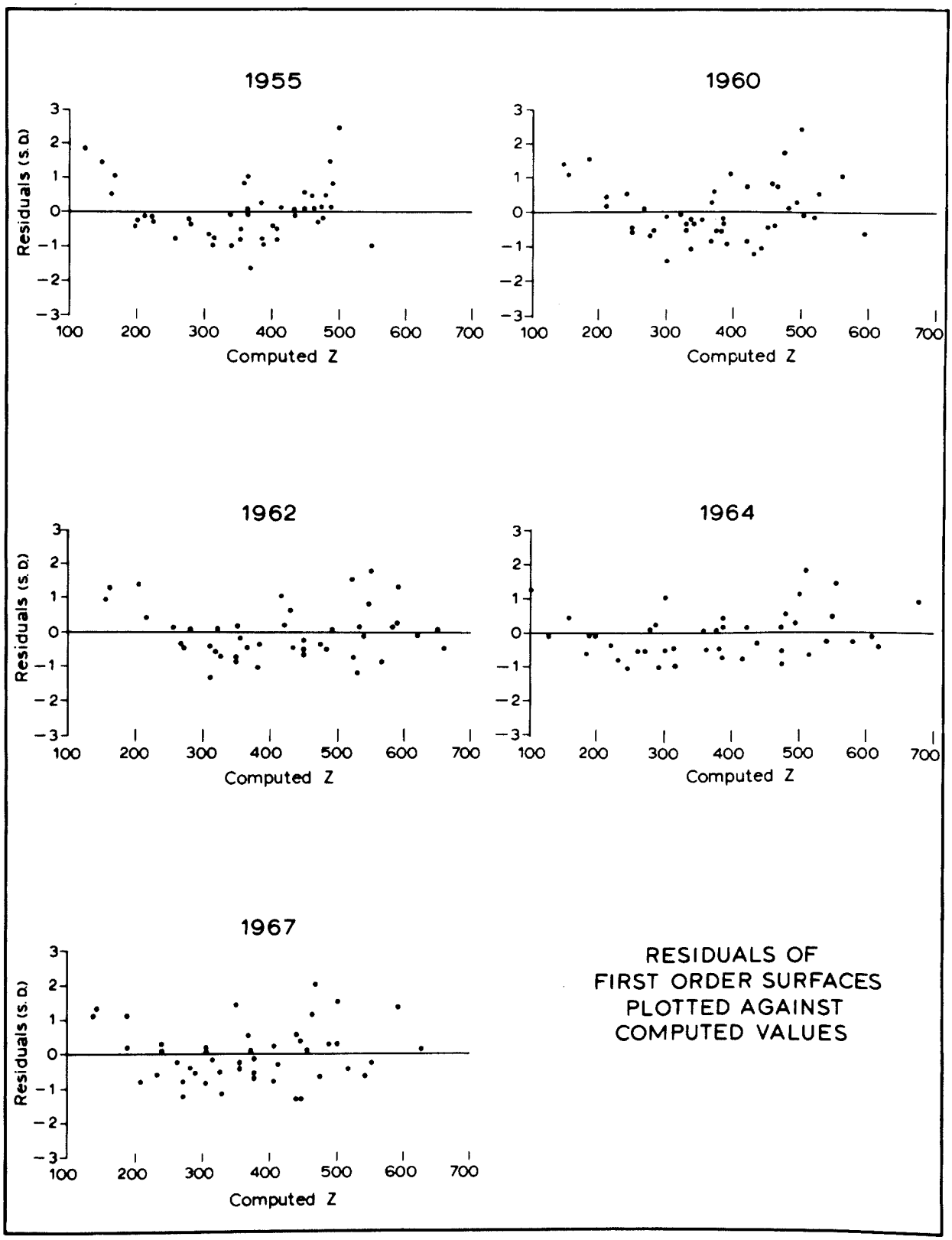
Source: trend surface analysis using non-Madrid data.

would involve a severe loss of information and therefore of accuracy in the final results. It can be argued that using the means is only a special case of a random sample, and leads to more accurate results. Empirical tests by Gray[32] using mean data in a trend surface analysis obtained the same results as with random data, but using only one tenth the number of data points. Also it should be borne in mind that F tests are fairly robust and their values likely to be virtually unaffected unless violation of the assumptions is noticeably marked[33].

A refinement of the F test elaborated by Thiel[34] and applied by Chayes[35] to trend surface problems is to use the test to check the significance of the <u>increase</u> in the regression sums of squares of successively higher order surfaces[36]. In this case the null hypothesis is that the extra coefficients do not add any significant increase in explanation to the next order trend surface. This procedure was applied to the Spanish data, and the results shown in Table 7:4. The first column shows the straightforward F test on the first order surfaces, and the other columns show the F test applied to the <u>increase</u> in the regression sums of squares due to successively higher order surfaces.

From Table 7:4 it can be seen that all the first order surfaces were significant at the 0.1% level, except 1960 which was significant at the 1.0% level. The change from the first to the second order surface was significant at the 0.1% level for all five years, whilst the change from the second to the third order surfaces was significant at the 1.0% level for 1960 and 1962, at the 5% level for 1955 and 1964, and was rejected at the 5% level for 1967. The change from the third to the fourth order surface was not significant at the 5% level for any of the years. In general the null hypothesis can be rejected at the 5% level for all surfaces until the fourth order. These results imply rejecting the use of fourth order surfaces, a conclusion which is in broad agreement with the results obtained in Table 7:3 above showing the percentage of variance explained.

FIGURE 7:2




RESIDUALS OF FIRST ORDER SURFACES PLOTTED AGAINST COMPUTED VALUES

FIGURE 7:3

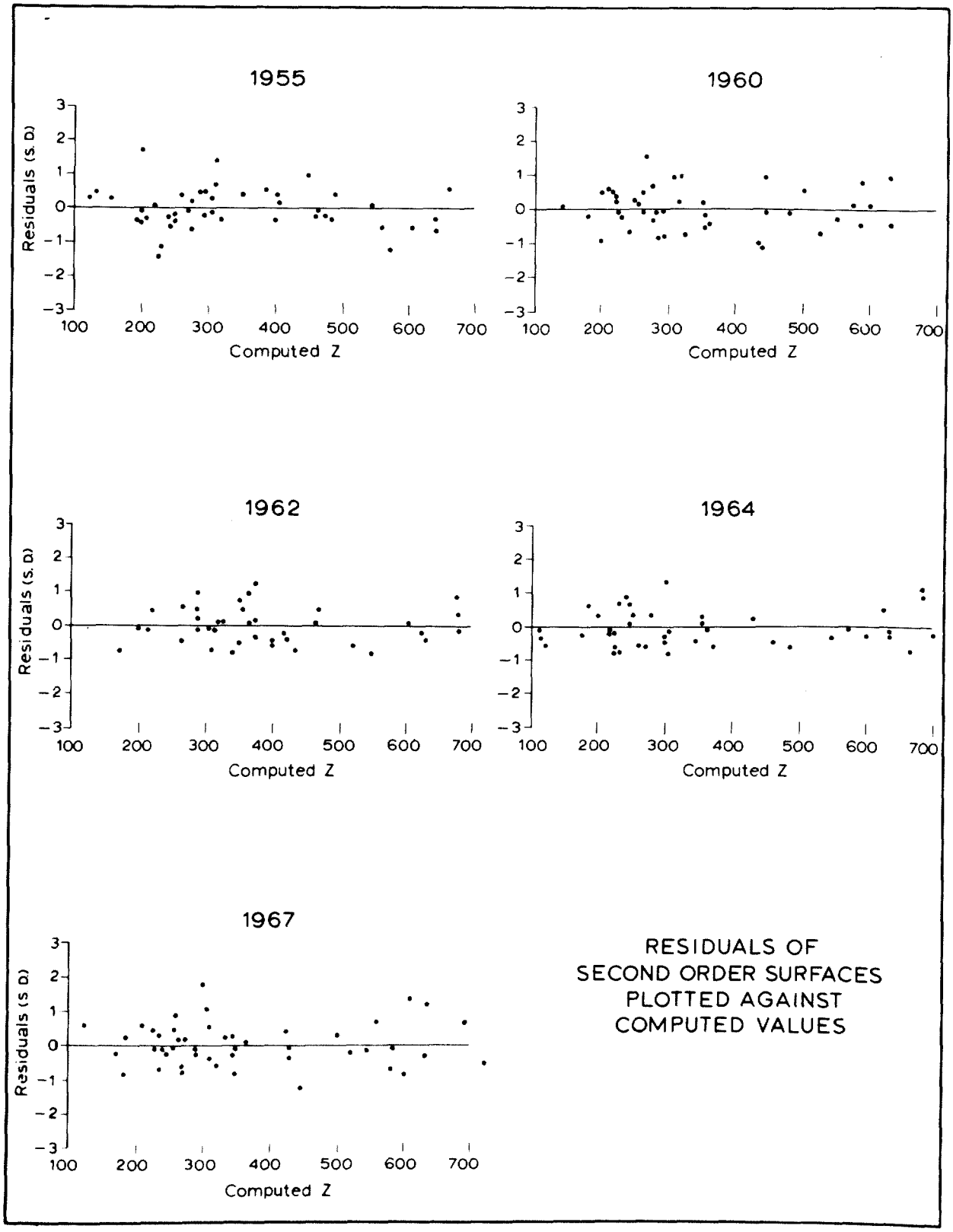
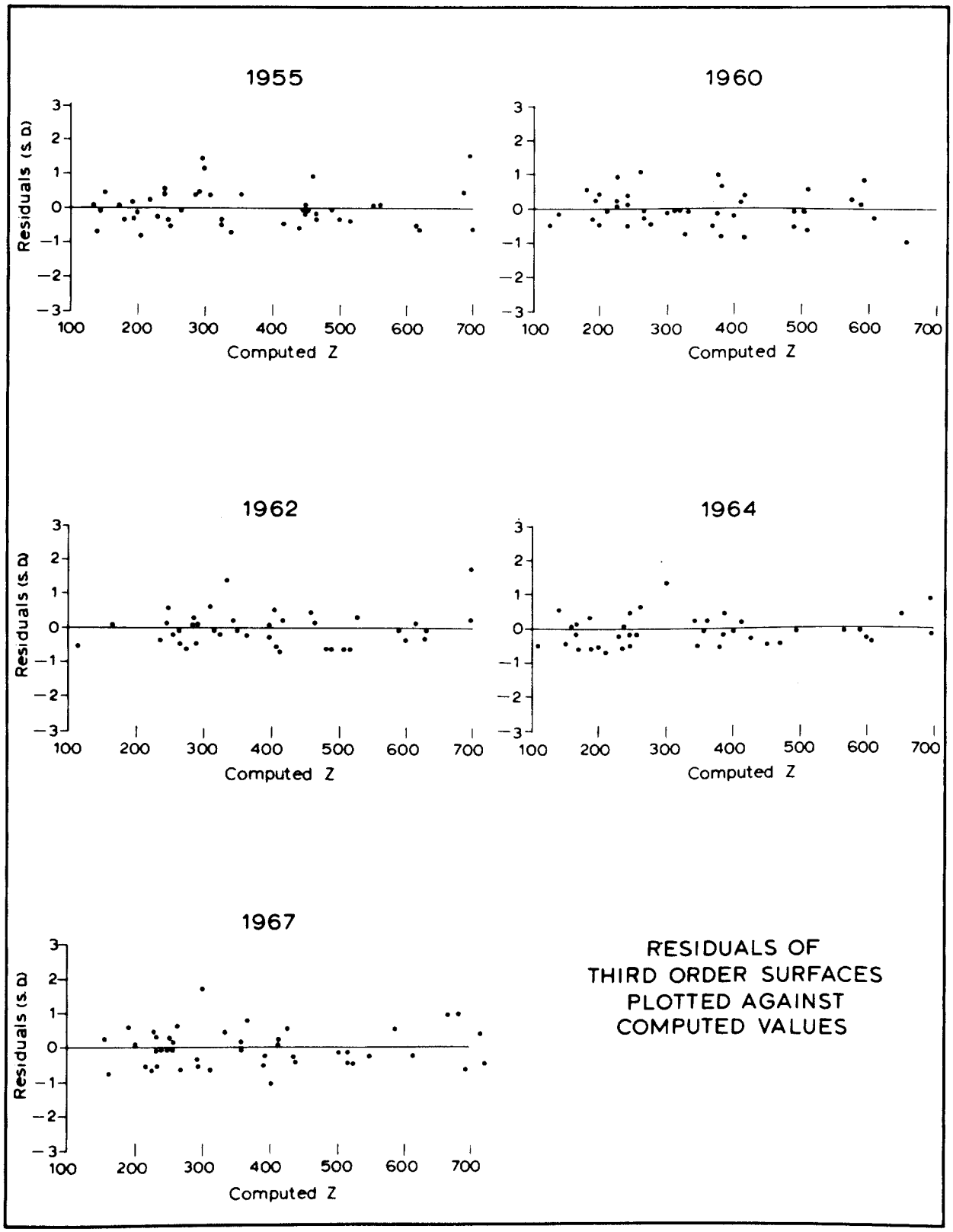

1955
1960
1962
1964
1967
Residuals (s. D)
Computed Z
100
200
300
400
500
600
700
3
2
1
0
−1
−2
−3
RESIDUALS OF
SECOND ORDER SURFACES
PLOTTED AGAINST
COMPUTED VALUES

FIGURE 7:4




RESIDUALS OF THIRD ORDER SURFACES PLOTTED AGAINST COMPUTED VALUES

For these reasons the fourth order surfaces were omitted from the rest of the analysis.

The use of significance tests has been the subject of some controversy in recent years[37], and Gould has pointed out that the tests have been misapplied in a great deal of geographic research[38]. However, it would be wrong because of this to ignore what is potentially a very powerful aid to research. Provided that the assumptions are reasonably satisfied, that the tests are used in a critical fashion, and that the results are used in conjunction and in comparison with the results of other procedures, there is no reason why significance tests should not be used.

A most useful method for choosing the correct model form is through the examination and analysis of the residuals[39]. Two methods of analysis are used here. In the first the standardised residuals are plotted against the computed Y values. This is shown in Figures 7:2, 7:3, 7:4. The graphs for the first order surfaces show a curvilinear effect. This is most marked in the 1955 surface and gradually diminishes towards 1967. This confirms that the first order surfaces are ill-fitting and are best replaced with a curvilinear surface.

The graphs of the standardised residuals for the second and third order surfaces both show an apparent lack of bias and either surface appears to be acceptable.

In the second analysis the standardised residuals were simply plotted onto a map of Spain (Figures 7:5, 7:6, 7:7). Although tests for spatial autocorrelation exist[40], the difficulties inherent in these tests make them of limited value. Working by inspection, spatial autocorrelation of the residuals would appear to be lessened by moving to higher order surfaces, although even in the third order surfaces it would appear still to exist.

All these tests suggest that the first order surface gives a reasonable fit to the data, but that a much better fit is obtained from a second order surface. The benefit of going to a third order is less

FIGURE 7:5

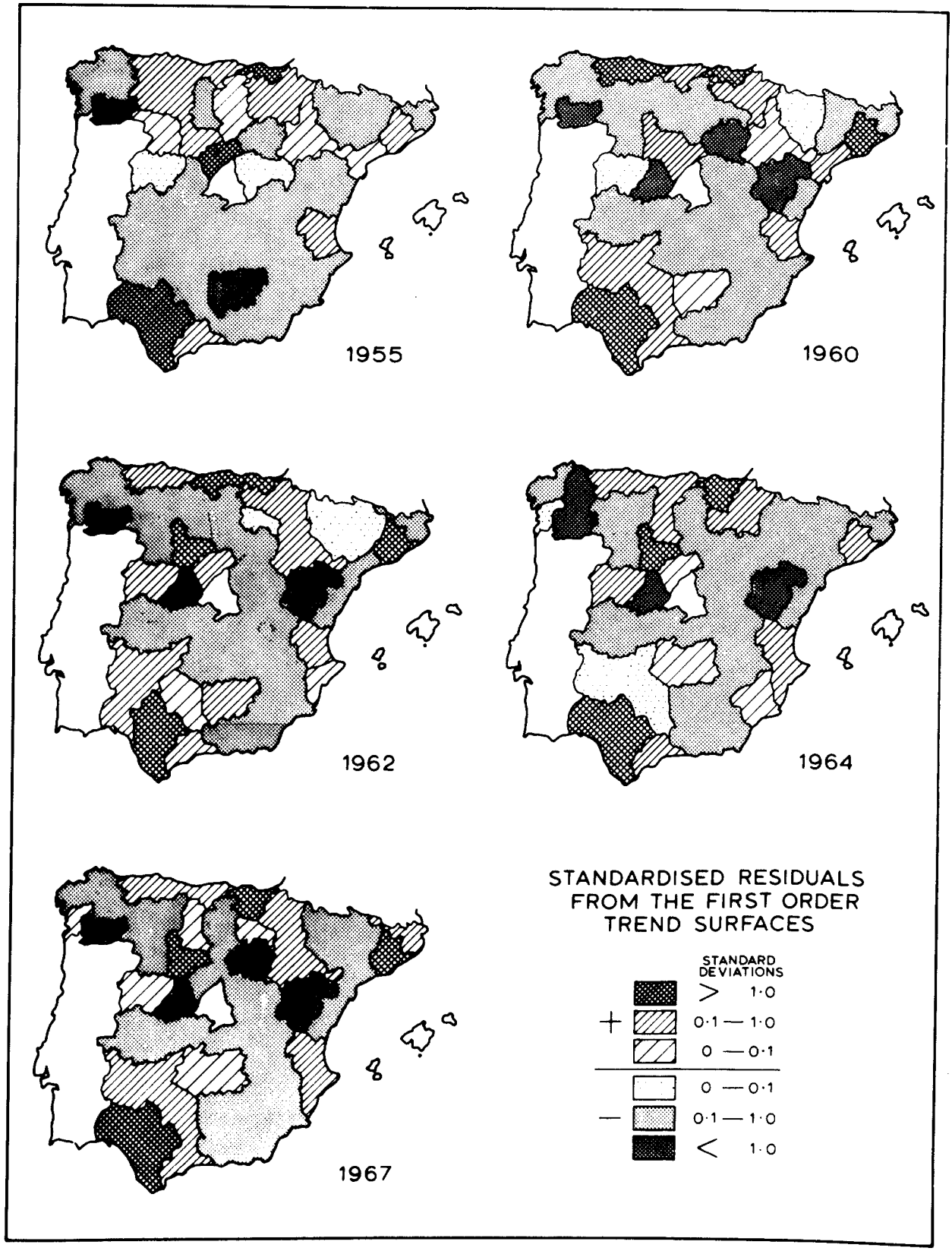

1955
1960
1962
1964
1967
STANDARDISED RESIDUALS FROM THE FIRST ORDER TREND SURFACES
STANDARD DEVIATIONS
> 1·0
0·1 — 1·0
0 — 0·1
0 — 0·1
0·1 — 1·0
< 1·0
+
—

FIGURE 7:6

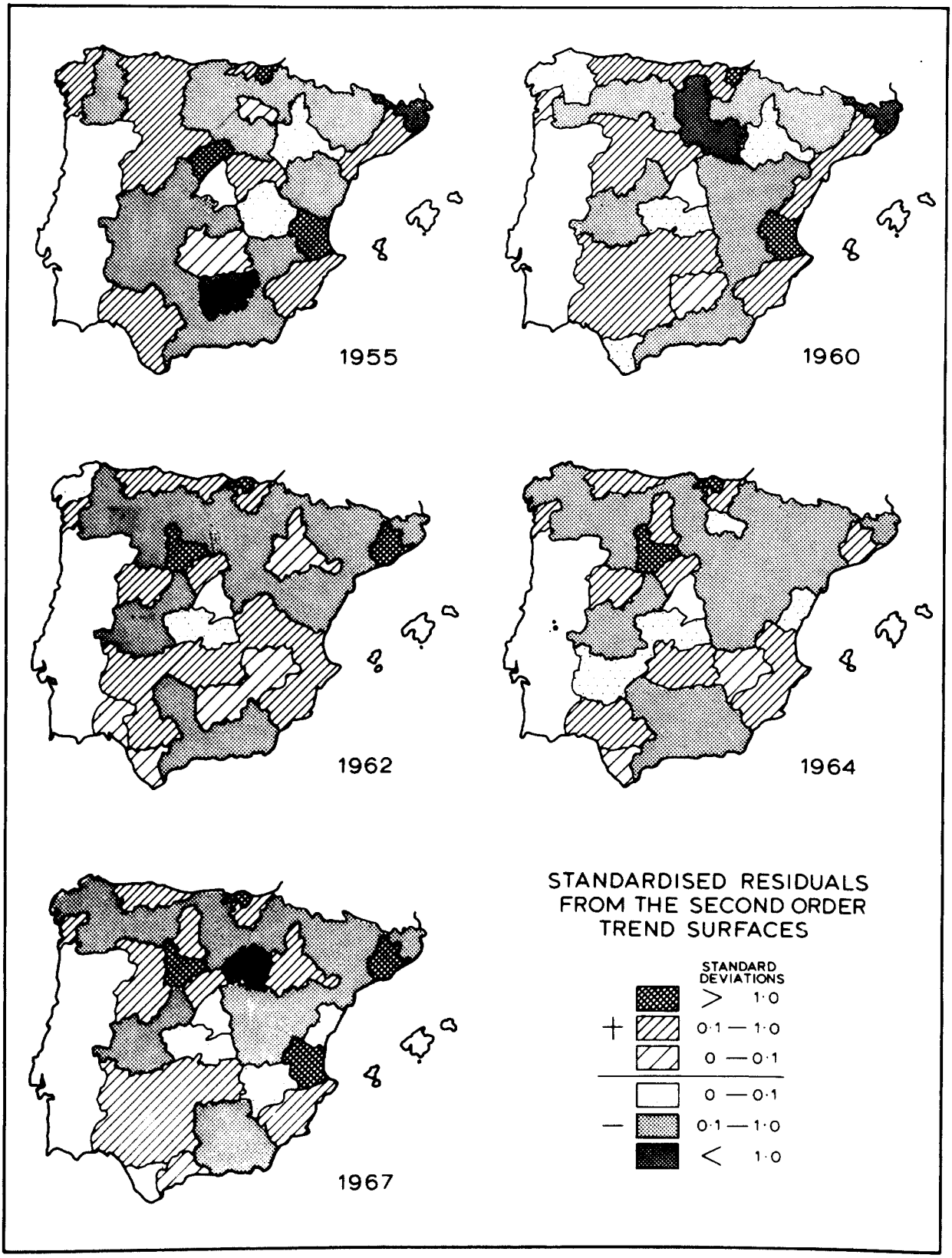
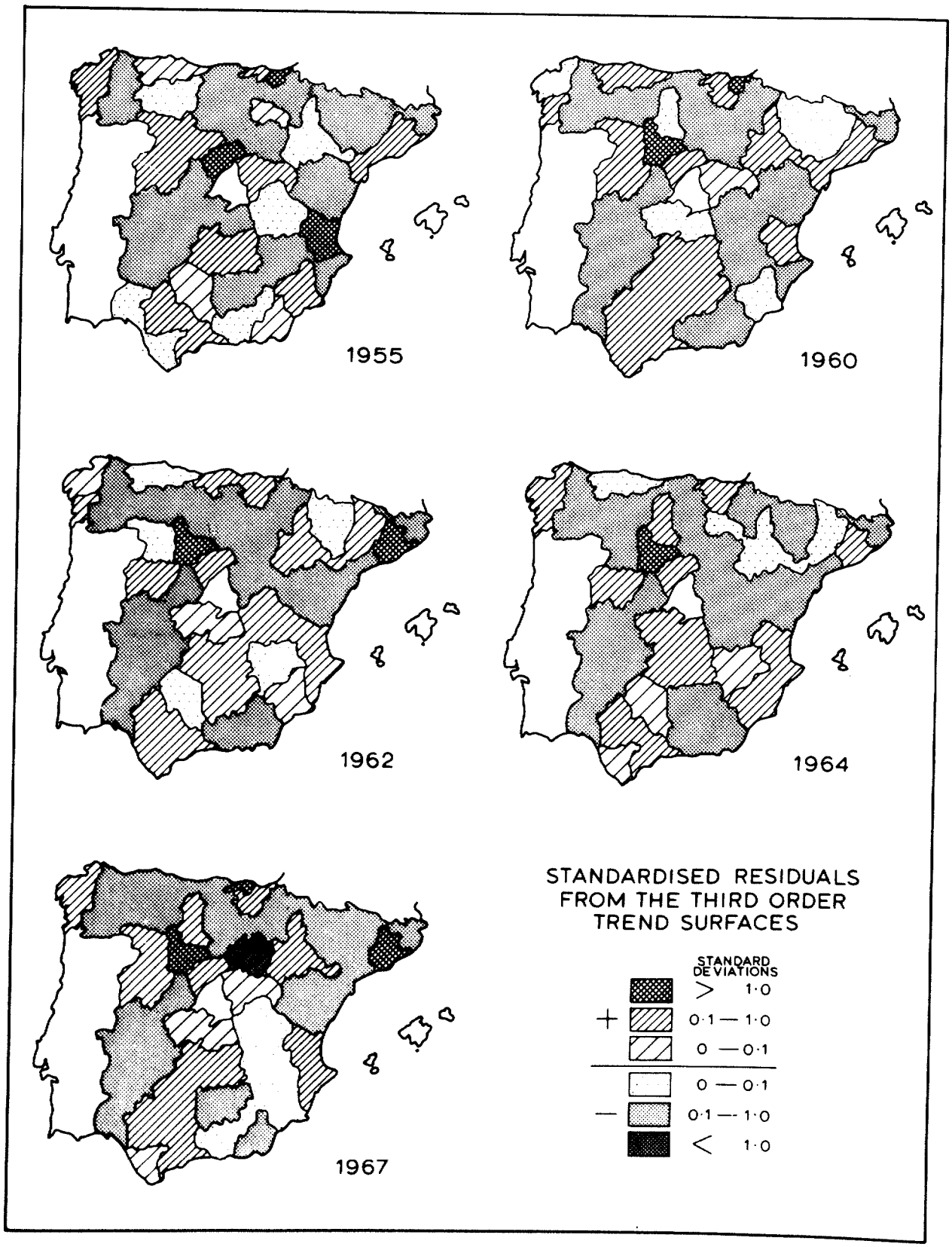

1955
1960
1962
1964
1967
STANDARDISED RESIDUALS FROM THE SECOND ORDER TREND SURFACES
STANDARD DEVIATIONS
> 1·0
+
0·1 — 1·0
0 — 0·1
0 — 0·1
—
0·1 — 1·0
< 1·0

FIGURE 7:7


1955
1960
1962
1964
1967
STANDARDISED RESIDUALS FROM THE THIRD ORDER TREND SURFACES
STANDARD DEVIATIONS
> 1·0
+
0·1 — 1·0
0 — 0·1
0 — 0·1
—
0·1 — 1·0
< 1·0

outstanding. In terms of residuals plotted against computed values (Figure 7:4) there appears to be a small improvement. Similarly there appears to be a small decrease in the amount of spatial autocorrelation (Figure 7:7). However consideration of the increase in percentage variance explained (Table 7:3) and the significance of this increase (Table 7:4) suggest that the third order surfaces give a good fit to the data and should be included in the analysis of the results.

The Results

The results of the trend surface analysis do not indicate a simple pattern of economic development in Spain. The first order surfaces (Figure 7:9) generally show a northeast to southwest gradient. This reflects the higher levels of economic activity in Catalonia and the Basque provinces, and the lower levels in Andalusia and Extremadura. The fairly steep gradient of these surfaces gives some idea of the rich-poor differential in Spain, and the persistence of the general angle of slope (Figure 7:8) indicates that this differential has stayed fairly constant over the period of study.

The residuals (Figure 7:5) show that the coastal areas generally lie above the first order surface, especially the Basque provinces, Catalonia and western Andalusia, the two exceptions being the coastal provinces of Galicia and the provinces of south-eastern Spain: Murcia, Almería and Granada. The interior provinces generally lie below this surface, with several provinces forming persistent 'sinks' of underdevelopment: Orense, Avila, Soria and Teruel.

The second order surfaces (Figure 7:10) all show a 'saddle' feature with the centre of the saddle located in New Castile and with two low areas or 'valleys', the first dropping away towards Portugal, the non-coastal periphery of Spain, the second dropping away towards Valencia. However progress during the 1955-1967 period shows a gradual eastward movement of the saddle, thus eradicating the Valencia valley and further accentuating

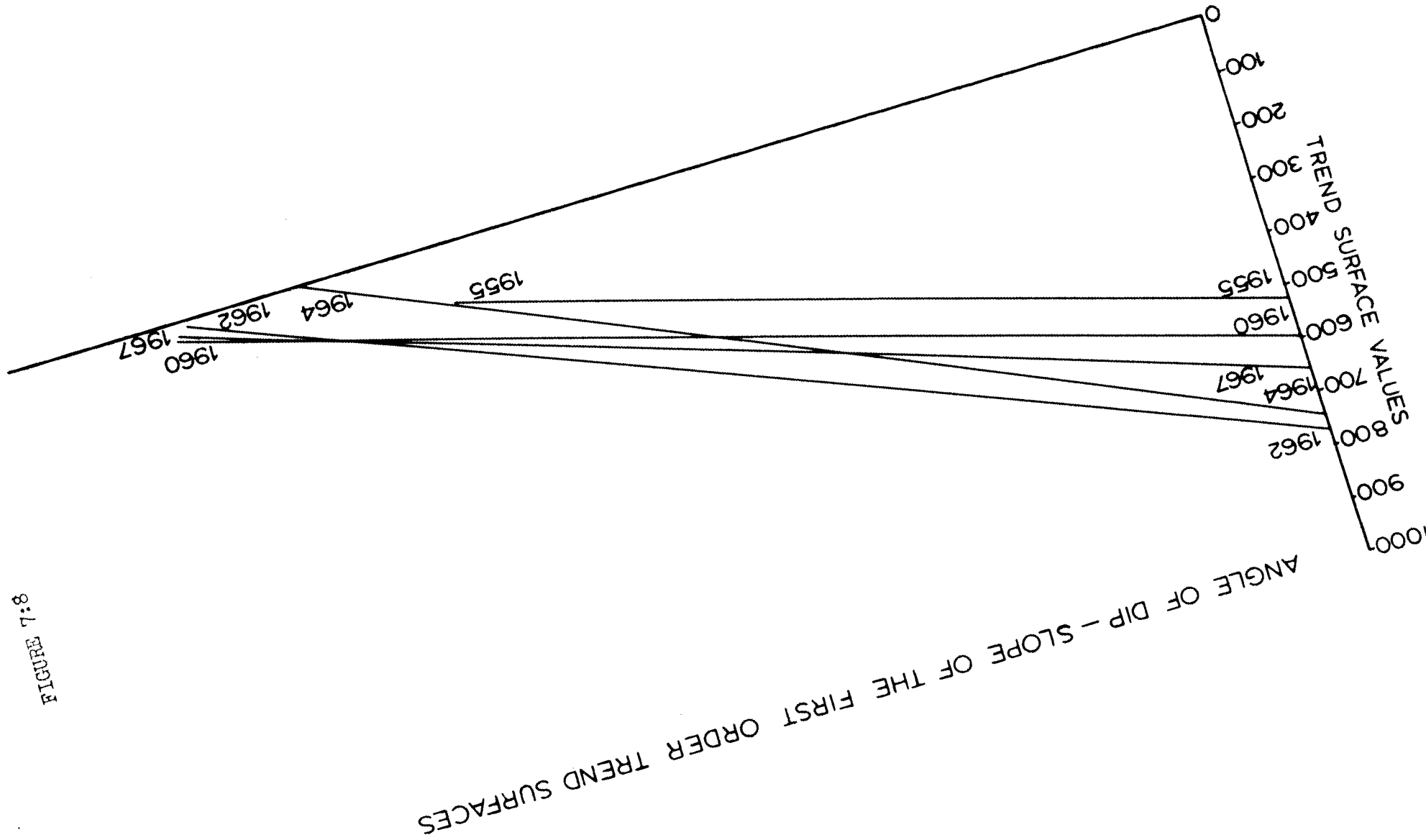

0
100
200
300
400
500
600
700
800
900
1000
TREND SURFACE VALUES
1955
1960
1962
1964
1967
1955
1960
1962
1964
1967
ANGLE OF DIP – SLOPE OF THE FIRST ORDER TREND SURFACES

FIGURE 7:8

FIGURE 7:9

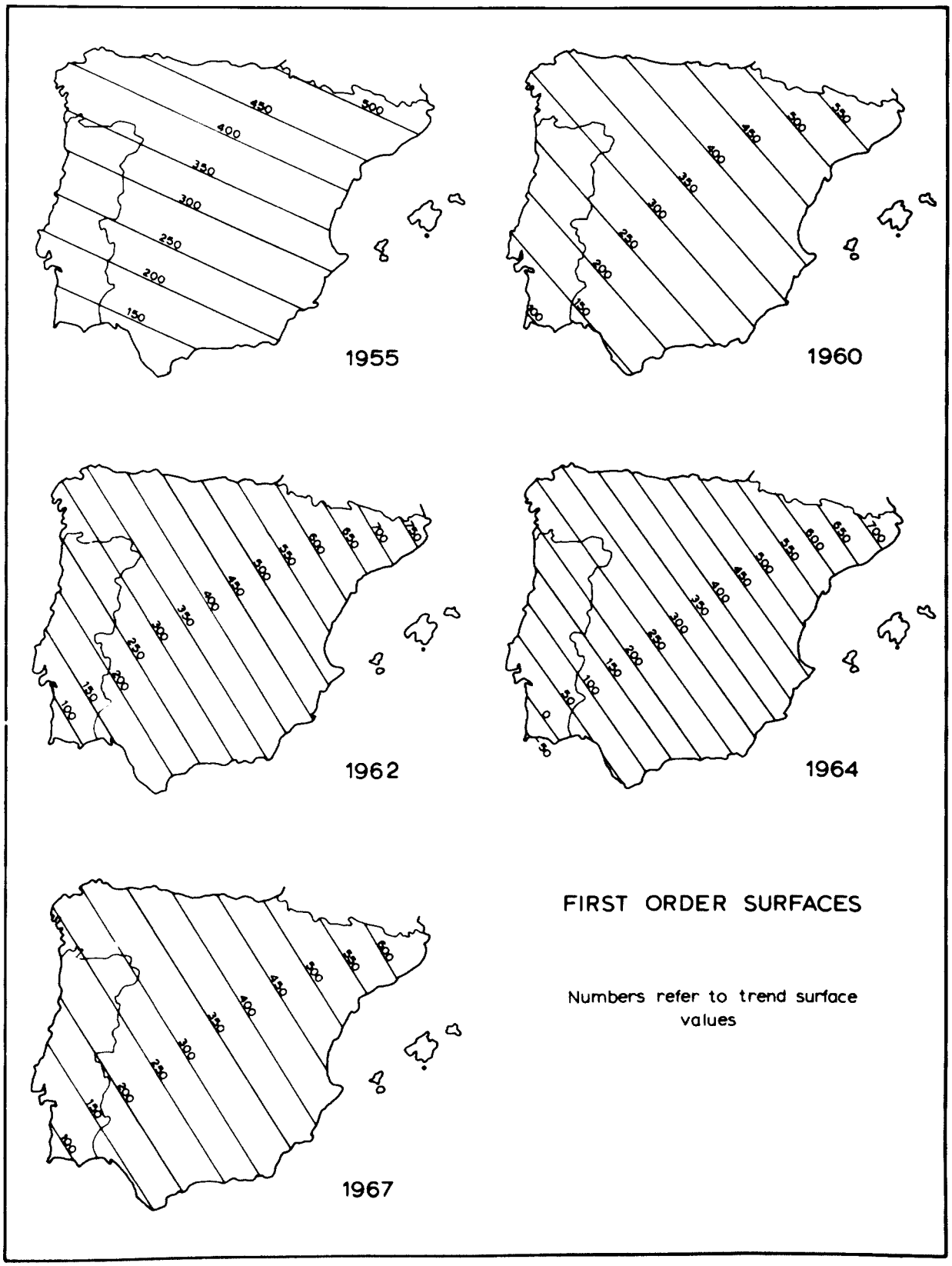

450
400
350
300
250
200
150
1955
500
450
400
350
300
250
200
150
1960
700
650
600
550
500
450
400
350
300
250
200
150
100
1962
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
1964
600
550
500
450
400
350
300
250
200
150
100
1967
FIRST ORDER SURFACES
Numbers refer to trend surface values

TABLE 7:10

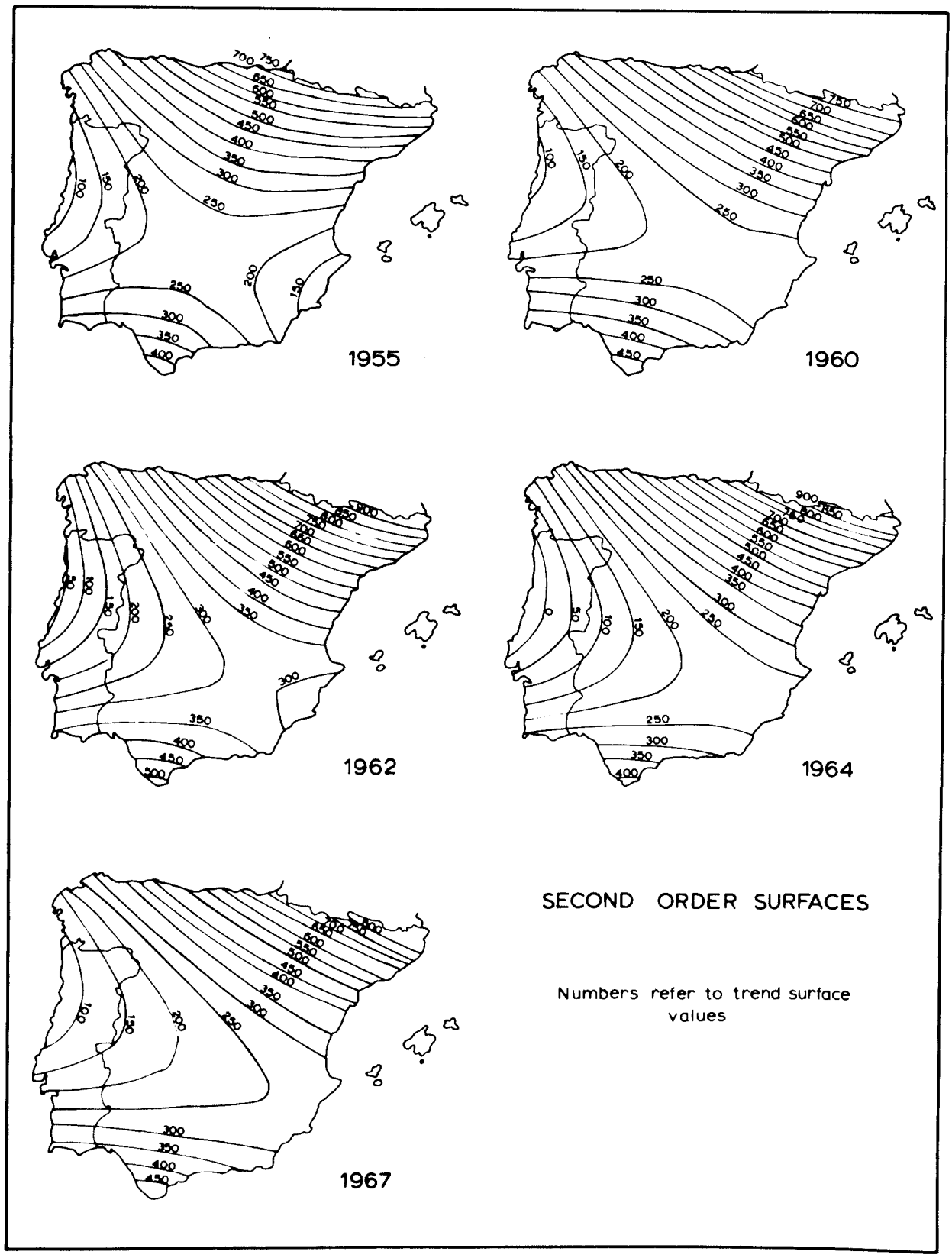
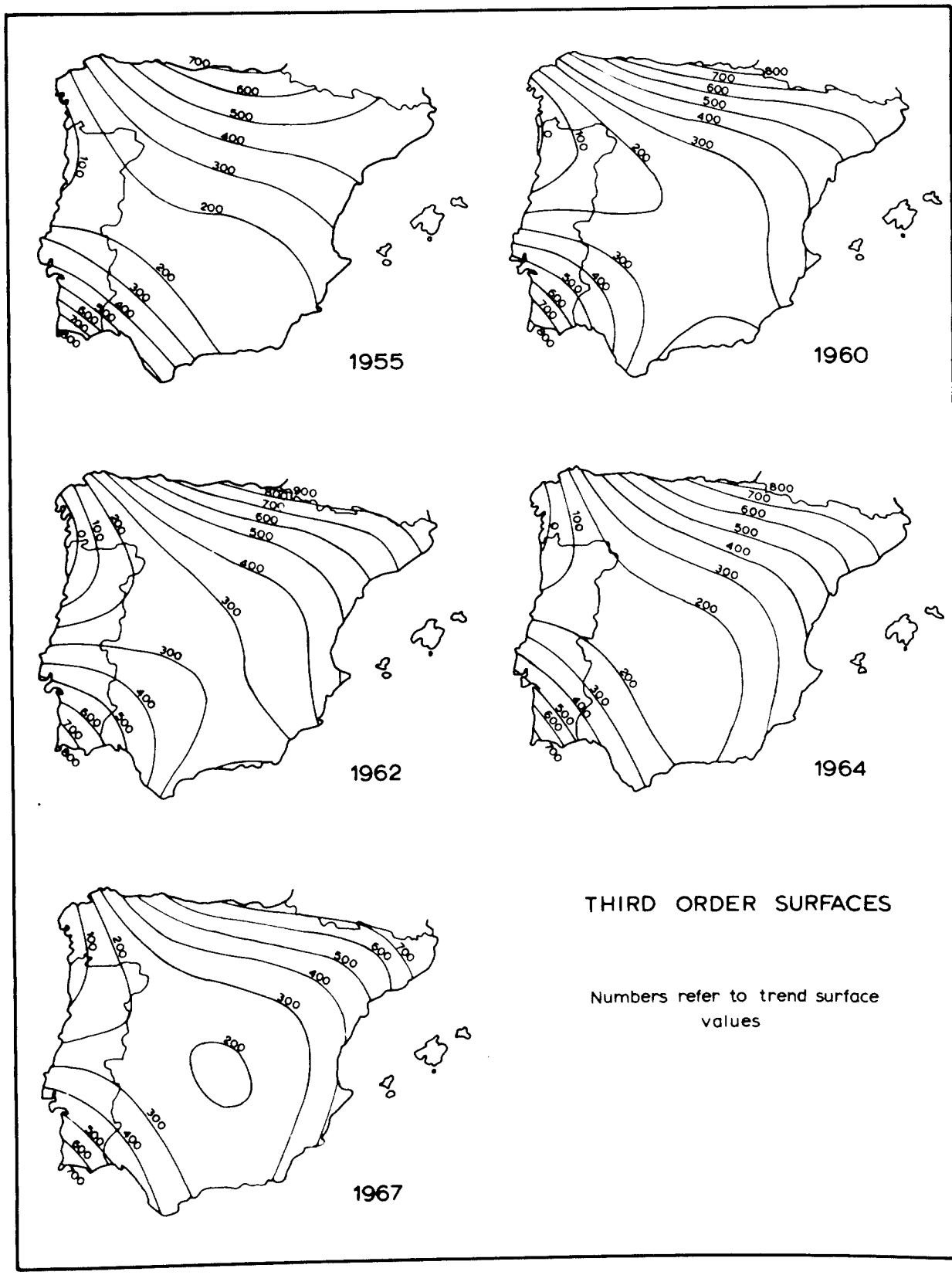

1955
1960
1962
1964
1967
SECOND ORDER SURFACES
Numbers refer to trend surface values

FIGURE 7:11


1955
1960
1962
1964
1967
THIRD ORDER SURFACES
Numbers refer to trend surface values

the Portugal valley.

The third order surfaces (Figure 7:11) show a similar pattern to the second order, a flat plateau area in the middle of central-southern Spain, with a ridge towards the north and east rising up to the Basque provinces, the Pyrenees and Barcelona; and a lesser ridge rising up to the south and west. From this central plateau a large valley is shown falling away towards Portugal. In the earlier surfaces another smaller valley can be seen in the eastern coastal zone around Valencia. However, by 1967 this smaller valley was becoming less important and only a narrow gap remained in the area of Murcia and Almería. The disappearance of this valley is probably due to the development of the tourist industry. Tourism has been a major promoter of development in Spain since 1959, both on a national[41] and a regional[42] level. In 1955 the main tourist provinces were Valencia, Barcelona and Gerona. This can be seen in the number of hotel places available in these provinces (Figure 7:12). During the 1960's the tourist industry spread along the Mediterranean coast, the most rapid growth in the number of hotel places occurring in Almería (x 16), Málaga (x 8) and Alicante (x 7), whereas in neighbouring provinces such as Valencia and Albacete they only doubled (see Figure 7:12).

This analysis suggests that two general economic forces have been identified by the trend surfaces. First there is a decline in economic activity away from France, shown by the first order surfaces and Figure 7:8. Those provinces which are located closest to Europe in general have higher levels of industrialization, whether measured in terms of percentage net production or percentage employment (Table 7:5), and also have higher levels of productivity, not only in agriculture and industry but in service as well (Figure 7:13). That is to say, those provinces closest to Europe have a more prosperous economic <u>structure</u> with more reliance on industry and services, and also appear to be more <u>productive</u>, with higher yields per active person in all three sectors of the economy.

FIGURE 7:12

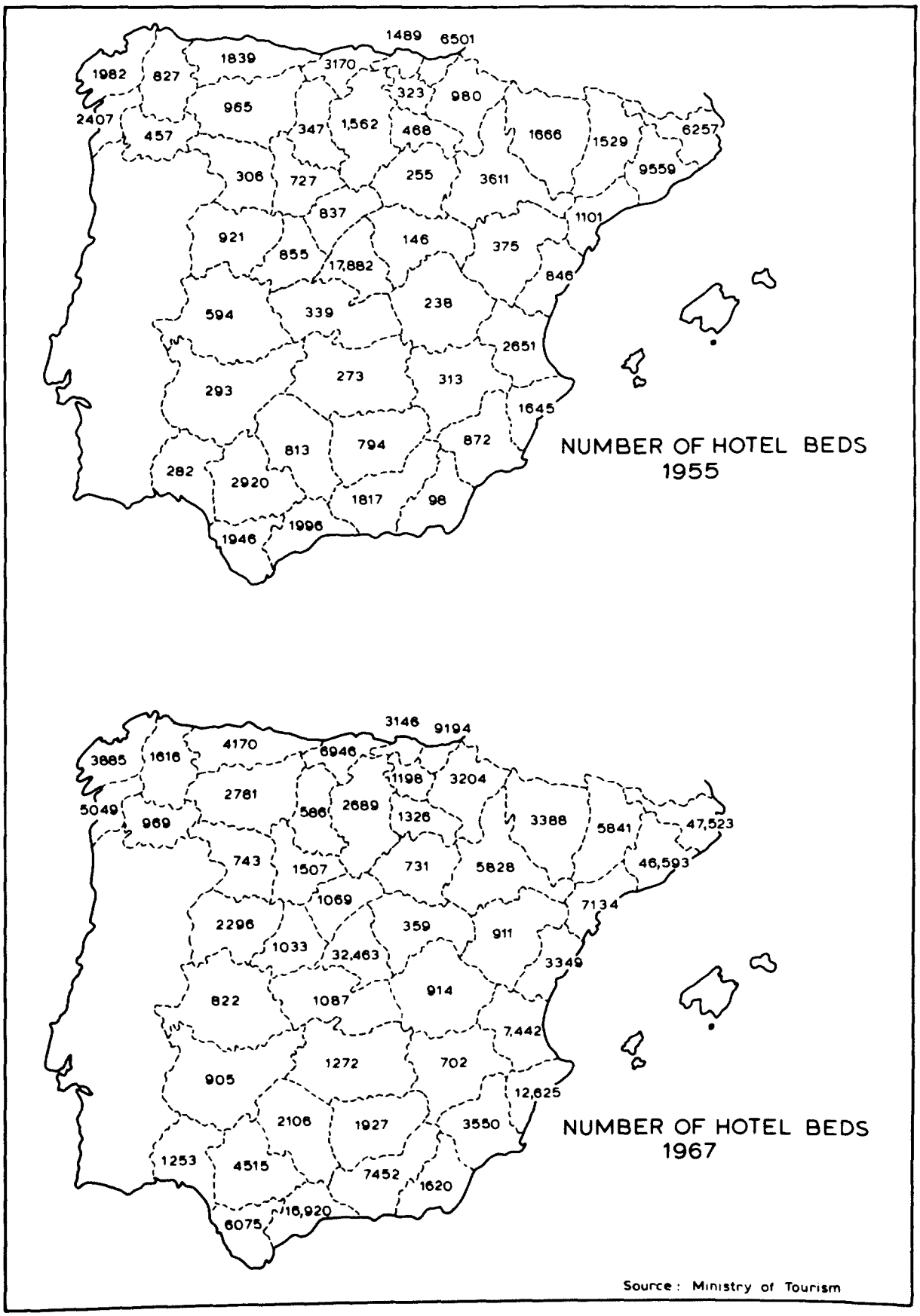

1489
6501
1839
3170
1982
827
323
980
965
2407
347
1,562
468
1666
1529
6257
457
9559
306
727
255
3611
837
1101
921
146
375
855
17,882
846
594
339
238
2651
273
313
293
1645
813
794
872
282
2920
1817
98
1996
1946
NUMBER OF HOTEL BEDS
1955
3146
9194
4170
3885
1616
6946
1198
3204
2781
5049
969
586
2689
1326
3388
5841
47,523
743
1507
731
5828
46,593
1069
7134
2296
359
911
1033
32,463
3349
822
1087
914
7,442
1272
702
905
12,625
2108
1927
3550
1253
4515
7452
1620
16,920
6075
NUMBER OF HOTEL BEDS
1967
Source : Ministry of Tourism

TABLE 7:5

Percentage Contribution to Net Production and Employment by Economic Sectors in 1967.

| Provinces | Net Production | | | Employment | | |
|---|---|---|---|---|---|---|
| | Agriculture and Fishing | Industry | Services | Agriculture and Fishing | Industry | Services |
| Alava | 9.6 | 56.4 | 34.0 | 18.8 | 55.4 | 25.8 |
| Albacete | 35.7 | 21.8 | 42.5 | 50.1 | 22.3 | 27.6 |
| Alicante | 14.9 | 41.5 | 43.6 | 23.9 | 45.4 | 30.7 |
| Almería | 26.1 | 26.6 | 47.2 | 50.2 | 22.1 | 27.7 |
| Avila | 39.8 | 15.8 | 44.4 | 62.5 | 13.2 | 24.3 |
| Badajoz | 40.8 | 18.8 | 40.4 | 54.9 | 19.9 | 25.2 |
| Barcelona | 2.8 | 47.0 | 50.2 | 4.6 | 55.7 | 39.7 |
| Burgos | 32.7 | 25.8 | 41.5 | 47.9 | 24.5 | 27.6 |
| Cáceres | 36.0 | 22.3 | 41.7 | 59.1 | 18.5 | 22.4 |
| Cádiz | 21.4 | 33.2 | 45.4 | 32.6 | 29.4 | 38.0 |
| Castellón | 30.7 | 32.9 | 36.4 | 45.5 | 31.1 | 23.4 |
| Ciudad Real | 25.7 | 40.1 | 34.2 | 49.5 | 26.5 | 24.0 |
| Córdoba | 29.7 | 25.7 | 44.6 | 47.9 | 22.7 | 29.4 |
| Corunna | 27.0 | 29.2 | 43.8 | 55.3 | 20.4 | 24.3 |
| Cuenca | 50.9 | 17.2 | 31.9 | 61.1 | 17.7 | 21.2 |
| Gerona | 12.1 | 37.4 | 50.5 | 21.4 | 42.1 | 36.5 |
| Granada | 26.7 | 20.9 | 52.4 | 48.9 | 18.7 | 32.4 |

TABLE 7:5 cont.

| Provinces | Net Production: Agriculture and Fishing | Net Production: Industry |
|---|---|---|
| Guadalajara | 31.2 | 28.5 |
| Guipúzcoa | 8.7 | 51.9 |
| Huelva | 24.2 | 32.7 |
| Huesca | 27.4 | 36.9 |
| Jaén | 26.5 | 27.7 |
| León | 27.2 | 33.8 |
| Lérida | 27.7 | 31.4 |
| Logroño | 33.2 | 29.8 |
| Lugo | 45.3 | 20.0 |
| Madrid | 1.6 | 31.3 |
| Málaga | 16.9 | 25.4 |
| Murcia | 21.0 | 32.7 |
| Navarre | 21.8 | 37.7 |
| Orense | 31.9 | 27.8 |
| Oviedo | 12.8 | 50.7 |
| Palencia | 26.3 | 34.4 |
| Pontevedra | 31.5 | 29.0 |
| Salamanca | 27.8 | 28.8 |
| Santander | 18.5 | 41.7 |

| Employment | | | |
|---|---|---|---|
| Services | Agriculture and Fishing | Industry | Services |
| 40.3 | 51.3 | 22.0 | 26.7 |
| 39.4 | 10.8 | 57.4 | 31.8 |
| 43.1 | 39.7 | 27.6 | 32.7 |
| 35.7 | 40.7 | 31.0 | 28.3 |
| 45.8 | 51.7 | 23.0 | 25.3 |
| 39.0 | 47.6 | 27.0 | 25.4 |
| 40.9 | 43.7 | 28.2 | 28.1 |
| 37.0 | 41.5 | 32.9 | 25.6 |
| 34.7 | 64.8 | 14.9 | 20.3 |
| 67.1 | 4.4 | 40.5 | 55.1 |
| 57.7 | 35.4 | 25.7 | 38.9 |
| 46.3 | 37.4 | 31.7 | 30.9 |
| 40.5 | 31.7 | 39.3 | 29.0 |
| 40.3 | 65.4 | 16.5 | 18.1 |
| 36.4 | 31.7 | 40.8 | 27.5 |
| 39.3 | 43.6 | 29.2 | 27.2 |
| 39.5 | 52.2 | 23.3 | 24.5 |
| 43.4 | 48.2 | 23.1 | 28.7 |
| 39.8 | 35.4 | 35.0 | 29.6 |

TABLE 7:5 cont.

| | Net Production | |
|---|---|---|
| Provinces | Agriculture and Fishing | Industry |
| Segovia | 33.3 | 25.5 |
| Seville | 21.2 | 27.3 |
| Soria | 38.2 | 21.2 |
| Tarragona | 23.1 | 35.1 |
| Teruel | 32.6 | 31.3 |
| Toledo | 31.8 | 29.0 |
| Valencia | 17.9 | 31.9 |
| Valladolid | 20.3 | 36.2 |
| Vizcaya | 5.1 | 52.0 |
| Zamora | 42.6 | 19.9 |
| Saragossa | 14.6 | 35.1 |

Source: Banco de Bilbao, 1969.

| Services | Employment | | |
|---|---|---|---|
| | Agriculture and Fishing | Industry | Services |
| 41.2 | 47.0 | 23.7 | 29.3 |
| 51.5 | 34.0 | 28.9 | 37.1 |
| 40.6 | 50.2 | 21.8 | 28.0 |
| 41.8 | 37.5 | 31.4 | 31.1 |
| 36.1 | 54.1 | 23.5 | 22.4 |
| 39.2 | 50.3 | 25.5 | 24.2 |
| 50.2 | 31.2 | 32.7 | 36.1 |
| 43.5 | 31.0 | 32.0 | 37.0 |
| 42.9 | 10.7 | 54.9 | 34.4 |
| 37.5 | 58.6 | 17.4 | 24.0 |
| 50.3 | 28.1 | 36.0 | 35.9 |

The second general economic force gives rise to a centre-periphery pattern, saucer shaped, with a flat plateau in the centre and rising towards the periphery. This is shown in the second and third order surfaces (Figures 7:10, 7:11). The centre-periphery pattern forms a persistent theme in Spanish economic history, and has been discussed by various authors. For example the first real census in Spain, the famous Relaciones Topográficas of 1575 and 1578, showed that 36.7% of the villages of New Castile were decreasing in population, in some cases by very large amounts[43]. The causes of this decrease were the difficult economic and social conditions then existing in central Spain, particularly the series of bad harvests and plagues which persisted until the middle of the eighteenth century[44]. To avoid poverty, disease and starvation many people emigrated to coastal Spain[45] or to some part of the Spanish empire[46]. R. Perpiñá Grau[47] has demonstrated by graphical means that during the first half of the twentieth century population density and various indicators of economic activity increased in intensity from the centre of Spain towards the periphery.

The centre-periphery pattern is accentuated at the periphery by flourishing coastal activities, by fishing which in some provinces makes a significant contribution to net production (e.g. in 1967: Pontevedra 8.4%, Huelva 8.2%, Cádiz 7.0%, Corunna 6.2%, Guipúzcoa 4.8%), by shipbuilding, especially in Vizcaya, Cádiz and Corunna provinces, and above all by tourism which now strongly affects every coastal province (Figure 7:12). The lack of these flourishing coastal activities helps to explain the development 'valley' along the Portuguese frontier.

In conclusion, the general pattern of development in Spain arising from these two general economic forces consists of a slope from the northeast to the southwest, and a saucer-shaped pattern with a high peripheral rim superimposed on this slope. There is a third force, not fully discussed in the analysis, which consists of a high peak of economic

TABLE 7:6

Third Order Trend Surface Residual Pattern.

| | 1955 | 1960 | 1962 | 1964 | 1967 |
|---|---|---|---|---|---|
| Alava | -2 | +2 | +2 | +2 | +2 |
| Albaceta | -2 | -2 | -1 | +1 | -1 |
| Alicante | -2 | -2 | +2 | +2 | +2 |
| Almería | +1 | -2 | -2 | -2 | -2 |
| Avila | -2 | -2 | -2 | -2 | -2 |
| Badajoz | -2 | -2 | -2 | -2 | -2 |
| Barcelona | +2 | +2 | +3 | +2 | +3 |
| Burgos | -2 | -2 | -2 | -2 | -2 |
| Cáceres | -2 | -2 | -2 | -2 | -2 |
| Cádiz | -1 | +2 | +2 | +1 | +1 |
| Castellón | -2 | -2 | -2 | -2 | -2 |
| Ciudad Real | +2 | +2 | +2 | +2 | +2 |
| Córdoba | +1 | +2 | -1 | +1 | +2 |
| Corunna | +2 | -1 | +1 | +2 | +2 |
| Cuenca | -1 | -2 | +2 | -2 | -1 |
| Gerona | -2 | -2 | -2 | -2 | -2 |
| Granada | -1 | -2 | -2 | -2 | -1 |
| Guadalajara | +2 | +1 | -2 | -2 | +1 |
| Guipúzcoa | +3 | +3 | +2 | +2 | +2 |
| Huelva | -1 | -2 | -2 | -2 | -2 |
| Huesca | -2 | -1 | -1 | -2 | -2 |
| Jaén | -2 | +2 | +2 | -2 | -2 |
| León | -1 | -2 | -2 | -2 | -2 |
| Lérida | -2 | -1 | +2 | -1 | -2 |
| Logroño | +1 | -2 | -2 | -1 | -2 |
| Lugo | -2 | -2 | -2 | -2 | -2 |
| Málaga | +2 | +2 | +2 | +2 | +2 |
| Murcia | +2 | -1 | +1 | +2 | -1 |
| Navarre | -2 | -2 | -2 | -2 | -2 |
| Orense | -2 | -2 | -2 | -2 | -2 |
| Oviedo | +1 | +2 | -1 | -1 | -2 |
| Palencia | -2 | -1 | -2 | +2 | +2 |
| Pontevedra | +2 | +2 | +2 | +2 | +2 |
| Salamanca | +2 | +2 | +2 | +2 | +2 |
| Santander | -2 | -2 | +2 | -2 | -2 |

TABLE 7:6 cont.

| | 1955 | 1960 | 1962 | 1964 | 1967 |
|---|---|---|---|---|---|
| Segovia | +3 | +2 | +2 | +2 | +2 |
| Seville | +2 | +2 | +2 | +2 | +2 |
| Soria | -2 | -2 | -2 | -2 | -3 |
| Tarragona | +2 | +2 | -2 | -2 | -2 |
| Teruel | -2 | -2 | -2 | -2 | -2 |
| Toledo | -2 | -1 | +1 | +2 | +1 |
| Valencia | +3 | +2 | +2 | +2 | +2 |
| Valladolid | +2 | +3 | +3 | +3 | +3 |
| Vizcaya | +2 | +2 | +2 | +2 | +3 |
| Zamora | +2 | +2 | -1 | -2 | +2 |
| Saragossa | -1 | +2 | +2 | -1 | +2 |

Residuals expressed in terms of standard deviations from the trend surface.

(+1) between 0 and +1 S.D.'s
(-1) between 0 and -1 S.D.'s
(+2) between +1 and +2 S.D.'s
(-2) between -1 and -2 S.D.'s
(+3) above +2 S.D.'s
(-3) below -2 S.D.'s

Source: Third Order Trend Surface Analysis

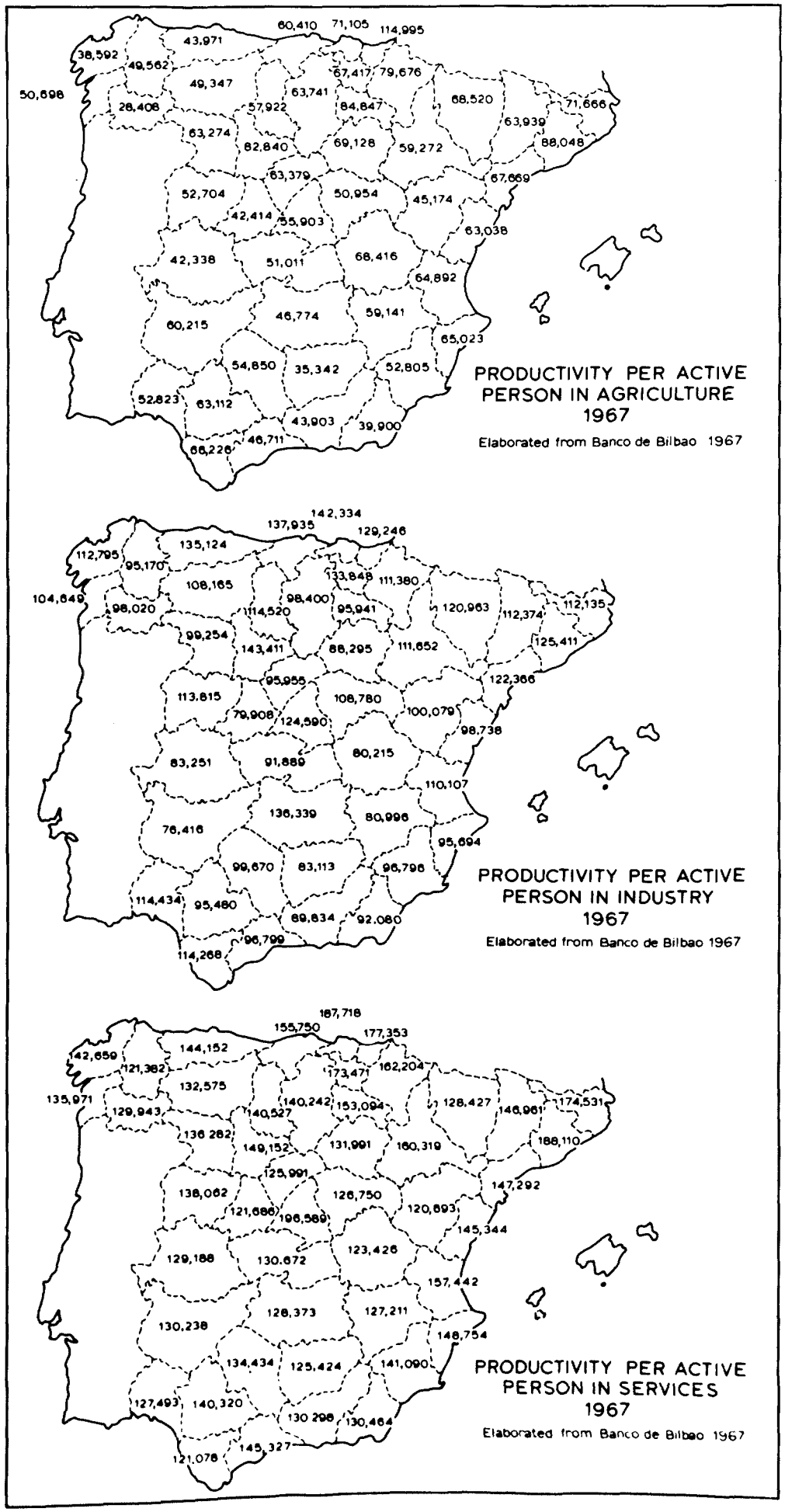
development at Madrid. In conjunction, these three economic forces produce a shape not unlike a tilted Mexican sombrero, with a dent in the rim towards Portugal, and a smaller and receding dent towards Almería and Murcia. The persistence of this general shape as shown by the very marked similarity of the trend surfaces obtained (Figure 7:9, 7:10, 7:11) suggests that the pattern of economic development has remained constant throughout the twelve year period 1955-1967.

The Residuals

The trend surfaces discussed above may be considered as representing the general economic forces which affect the whole nation. The residuals on the other hand may be considered as indicating local economic forces. Amongst the residuals the high points represent areas experiencing a level of growth that is higher than the regional average and can be considered as natural 'growth poles', and the low points represent the low growth areas or natural 'growth-sinks'. That is to say, these are the provinces which, due to local economic forces, do well or badly in comparison with the regional trend as defined by the trend surfaces.

There are eleven provinces that consistently form low points (Table 7:6) and they can be divided into subgroups. First there are the mountainous provinces of Lugo, Orense, Avila, Soria and Teruel, which count amongst the poorest provinces in Spain. These provinces are the most dependent on agriculture of all the Spanish provinces, employment in agriculture as a percentage of active population being: Lugo 64.8%, Orense 65.4%, Avila 62.5%, Teruel 54.1% and Soria 50.2% (Table 7:5) Despite this very high dependence these provinces have the lowest rates of output per active person in agriculture (Figure 7:13). The same five provinces also have amongst the lowest levels of productivity in industry and in the services (Figure 7:13). This shows that these provinces not only have a poor economic structure, with high dependence on agriculture, but also have very poor levels of productivity, not only in agriculture

FIGURE 7:13


60,410
71,105
114,995
43,971
38,592
49,562
49,347
67,417
79,676
50,698
63,741
68,520
71,666
26,408
57,922
84,847
63,939
63,274
82,840
69,128
59,272
88,048
63,379
67,669
52,704
50,954
45,174
42,414
55,903
63,038
42,338
51,011
68,416
64,892
46,774
59,141
60,215
65,023
54,850
35,342
52,805
52,823
63,112
43,903
39,900
46,711
66,226
PRODUCTIVITY PER ACTIVE PERSON IN AGRICULTURE 1967
Elaborated from Banco de Bilbao 1967
142,334
137,935
129,246
135,124
112,795
95,170
133,848
111,380
108,165
104,649
98,400
98,020
114,520
95,941
120,963
112,374
112,135
99,254
143,411
88,295
111,652
125,411
95,955
122,366
113,815
108,780
79,908
124,590
100,079
98,738
83,251
91,889
80,215
110,107
136,339
80,996
76,416
95,694
99,670
83,113
96,796
114,434
95,460
89,834
92,080
96,799
114,268
PRODUCTIVITY PER ACTIVE PERSON IN INDUSTRY 1967
Elaborated from Banco de Bilbao 1967
187,718
155,750
177,353
144,152
142,659
121,382
173,471
162,204
132,575
135,971
140,242
153,094
128,427
146,961
174,531
129,943
140,527
136 282
149,152
131,991
160,319
188,110
125,991
138,062
126,750
147,292
121,686
196,589
120,693
145,344
129,188
130.672
123,426
157,442
128,373
127,211
130,238
148,754
134,434
125,424
141,090
127,493
140,320
130 298
130,464
121,078
145,327
PRODUCTIVITY PER ACTIVE PERSON IN SERVICES 1967
Elaborated from Banco de Bilbao 1967

but in all three sectors of the economy. In the poorest and most underdeveloped provinces of Spain all economic activities are depressed.

Very similar to this first group are the two Extremeñan provinces of Badajoz and Cáceres. Again there is a high dependence on agriculture, the employment percentages being 59.1% for Cáceres and 54.9% for Badajoz. Although productivity in agriculture for Cáceres is low (Figure 7:13), it is much higher in Badajoz, presumably as a result of the development plan for the province[48]. Industrial productivity is particularly low, especially in comparison with the neighbouring provinces, and productivity in the service sector is about average for the region.

Burgos province has a fairly distinct pattern of development. It has a high dependence on agriculture for employment (47.9% in 1967). However, productivity in agriculture is above the national average although generally below that of the neighbouring provinces. Productivity in industry and the services is below both the national and the regional averages. In summary Burgos is not a poor province on an absolute scale, but only by comparison with the standards of a region which includes the rich Basque provinces.

The last three provinces which form consistent low points are far less dependent on agriculture for their net income (Table 7:5). In terms of employment, agriculture involves 45.5% of the active population of Castellón, 31.1% in Navarre, and only 21.4% in Gerona. In terms of productivity all three provinces do much better than the national average in agriculture, slightly below the national average in industry, and about or above the national average in the services. Like Burgos these provinces are not poor on an absolute scale, indeed they form some of the wealthier provinces of Spain; but all three have levels of production and wealth consistently below the regional trend.

There are eleven provinces that form high points (Table 7:6) of which four occur in the traditionally accepted advanced regions of Spain. These

are the provinces of Barcelona, Guipúzcoa, Vizcaya and Valencia. To this group may be added Valladolid, which although isolated in the norther Meseta and not normally considered as one of the major economic provinces of Spain, nevertheless shows a similar pattern of development to the rest of the group. Three provinces of this group have a very low dependence on agriculture for employment. These are Barcelona with 4.6%, Vizcaya 10.7% and Guipúzcoa 10.8%. This small proportion of the labour force maintains productivity levels in agriculture which are the highest (in the case of Guipúzcoa and Barcelona) and sixth highest (in the case of Vizcaya) in Spain.

In general there is a close link between the levels of employment and levels of output in agriculture. The strength of this link was tested by correlation analysis. 1967 data for employment (Table 7:5 col. 4) and productivity (Figure 7:13) were used. The results[49] gave a correlation coefficient of -0.6115, a strong negative relationship showing that the higher the percentage of employment the lower the average level of productivity in agriculture.

Valencia, a province famous for its flourishing agriculture, is seen to have a level of productivity well below the three provinces previously mentioned, although still above the national average (Figure 7:13). It would appear that Valencia is a victim of the close relationship between levels of productivity and percentage employment, having 31.2% of active population in agriculture. However, although Valencia has a rich huerta, the province also has some poor agricultural regions in the interior, and this will be reflected in the average data for the province.

Valladolid, like Valencia, has a high level of employment in agriculture (31.0%), but unlike Valencia has a very high level of productivity, thus going against the national trend as expressed in the correlation coefficient above.

In all five provinces the levels of productivity in industry and the

services are amongst the highest in Spain (Figure 7:13). These figures show that in the five wealthiest and most developed provinces all three sectors of the economy prosper, indicating a similar pattern but at the other end of the scale to the five poorest provinces.

The provinces of Segovia, Salamanca and Pontevedra have a similar pattern of development. All three are very dependent on agriculture for employment: Pontevedra 52.2%, Salamanca 48.2% and Segovia 47.0%. In levels of productivity the provinces lie at or below the national average in all three sectors of the economy, but remain at or above the regional levels. These three provinces achieve prominence by being relatively prosperous in poor areas.

Similarly, Seville and Málaga provinces have levels of productivity in all three sectors of the economy below the national average but above the regional trend. This is most noticeable in the case of the service sector and probably reflects the strength of the tourist industry in both provinces.

The last province which consistently does better than the regional trend is Ciudad Real, and forms something of an anomaly. The level of productivity in agriculture and the service sector is as low as or lower than in the neighbouring provinces, and its prominence is solely due to very high productivity levels in industry. This is a result of the I.N.I. company Calvo Sotelo at Puertollano whose activities including bituminous coal mining, power generation, oil refining and the production of petrochemicals. This is the only industrial development of any size within the province and is a highly-capitalized industrial complex. It is thus not surprising that the province has, after Vizcaya, the highest level of industrial productivity in Spain.

The achievements of the provinces containing the seven original growth poles fall into two distinct groups. The five polos de desarrollo - Corunna, Pontevedra, Seville, Valladolid and Saragossa - had levels of

economic activity higher than the regional trends and all formed pronounced natural growth-poles; whereas the two polos de promoción, Huelva and Burgos, had levels of economic activity below the regional trends and formed pronounced growth-sinks (Table 7:6). It has been noted above that in Burgos productivity levels in agriculture were relatively better than those in industry or the service sector. Huelva, however, shows an opposite tendency. Productivity levels in agriculture and the services were below the regional trend whilst industry was above (Figure 7:13). This relatively better showing in industry is largely due to the industrial development based on the pyrites mines.

The three provinces of Seville, Valladolid and Saragossa all have levels of productivity in agriculture, industry and the services at the same level or above the national averages, whereas Corunna and Pontevedra have levels of productivity above the regional trend but below the national averages (Figure 7:13). Corunna and Pontevedra also have less favourable economic structures than the other three provinces. Corunna and Pontevedra have 55.3% and 52.2% of their total employment in agriculture, whereas Seville has 34.0%, Valladolid 31.0% and Saragossa 28.1% (Table 7:5). This indicates that the three provinces Seville, Pontevedra and Saragossa form strong natural growth poles, whereas Corunna and Pontevedra are natural growth poles only by the standards of the region of Galicia. This suggests that these two provinces should receive extra assistance beyond that given to the other polos de desarrollo.

The case of the two polos de promoción suggests that both provinces will require considerable assistance before they can raise the levels of economic activity to the standard of the surrounding region. To this extent the extra benefits available in both provinces would appear to be justified.

If it is assumed that a planned growth pole should have a fairly buoyant economy, certainly by comparison with the surrounding region, them by this criterion the choice of the five polos de desarrollo would appear

to be justified. However, it should be mentioned that the same criterion would justify the choice of other growth poles, for example in the provinces of Salamanca, Ciudad Real and Málaga, which are all in under-developed regions, and have all shown levels of economic activity consistently above the regional trend (Table 7:6).

Conclusions

In their 1965 paper reviewing the possible applications of trend surface analysis in geographical research, Chorley and Haggett strongly advocate its application in the field of human geography.

> ".... there seems no reason, other than convention or lethargy, why they (trend surface techniques) should not be very widely adapted for use in all branches of geography, both physical and human, in the immediate future."[50]

Despite this recommendation, applications in human geography have been few and far between. A notable exception is Haggett's paper on the use of trend surface analysis in intra-regional comparisons[51], derived from earlier work with geological applications by Merriam and Sneath[52]. Another example is the application of trend surface analysis to the residuals from regression by Robinson and Fairbairn[53].

It is believed that the application of trend surface analysis in this chapter is a legitimate use of this technique. The analysis has been used to identify two distinct features. First, it has identified the generalized pattern of development in Spain which, it is argued, is the result of economic forces that affect the whole country. Second, the analysis has revealed the local variations which are thought to be due to local economic forces and has thereby identified a number of natural growth poles and growth sinks in Spain.

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